E4559 V5

REPUBLIC OF GHANA

MINISTRY OF ROADS & HIGHWAYS

Department of Feeder Roads (DFR)

Transport Sector Project

29 SELECTED FEEDER ROADS TROPICAL CONTINENTAL ZONE

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS v. 2

[ESMPs]

August 2011

List of Acronyms

ABC	Abstinence, Be faithful & Condom use
DA	District Assembly
DE	District Engineer
DFR	Department of Feeder Roads
EA	Environmental Assessment
EHS	Environment Health and Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EP	Environmental Permit
EPA	Environmental Protection Agency
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESMPI	Environmental and Social Management Plan Implementation
GAC	Ghana AIDS Commission
GoG	Government of Ghana
HIV/ AIDS	Human Immuno-deficiency Virus / Acquired Immune Deficiency Syndrome
ILO	International Labour Organisation
LI	Legislative Instrument
MDAs	Ministries, Departments and Agencies
MEST	Ministry of Environment, Science and Technology
MLGRD	Ministry of Local Government and Rural Development
NEAP	National Environmental Action Plan
NETF	National Employment Task Force
OSH	Occupational Safety and Health
PEA	Preliminary Environmental Assessment
PPE	Personal Protective Equipment
PPEs	Personal Protective Equipment
RE	Regional Engineer
RPF	Resettlement Policy Framework
SE	SE
SE	Site Engineer
SO	Site Office
SO	Site Office
ToR	Terms of Reference
TSP	Transport Sector Project
VOC	Vehicle Operating Cost

EXECUTIVE SUMMARY

Introduction

The Department of Feeder Roads of the Ministry of Roads and Highways (MRH) have selected eighty-four (84) feeder roads for minor rehabilitation/spot improvement and other maintenance works throughout the country. The maintenance works fall under the Transport Sector Project (TSP) to be financed by the International Development Association (IDA).

The implementation of projects under the TSP is guided by the Environmental and Social Management Framework (ESMF) and the Resettlement Policy Framework (RPF) of the MRH. This is to ensure compliance with the relevant environmental and social safeguard requirements for sound project execution. Therefore in line with the ESMF and the RPF, 84 ESMPs have been prepared for the maintenance works on the 84 selected feeder roads. The roads have been grouped under the four major eco-climatic zones of Ghana – the South-Western Equatorial (SWE); Dry Equatorial (DE); Wet Semi Equatorial (WSE); and the Tropical Continental (TC) Zones. In order to facilitate administrative and implementation arrangement of the ESMPs, the eco-climatic zones have been aligned with the relevant regional boundaries. Thus, the ten administrative regions of Ghana have been grouped into four, based on their broad eco-climatic characteristics as follows:

- Western Region - South Western Equatorial Zone
- Ashanti, Eastern and Volta (middle) Regions - Wet Semi-Equatorial Zone
- Central, Greater Accra and Volta (southern) Regions - Dry Equatorial Zone
- Brong Ahafo, Northern, Upper East & West and Volta (northern part) Regions - Tropical Continental Zone

This report focuses on the rehabilitation works in the Tropical Continental Zone, and presents the ESMPs for the twenty-nine (29) selected feeder roads in nineteen districts.

The scale of the maintenance/rehabilitation works is rather limited, with localised impacts within the existing right of way (RoW). No land outside the RoW or property, building or any structure will be affected by the road works, therefore no compensation or resettlement will be required. Also no sensitive sites or resources such as forest reserve, sacred grove, cemetery, shrine or other places of historical and cultural interests are within or near the RoW of any of the 29 roads earmarked for maintenance. Furthermore, the maintenance works will not affect any utility lines such as water, electricity or telecommunication lines. Thus, the World Bank's safeguard Policies such as the Involuntary Resettlement, Management of Cultural Property, Conservation of Natural Habitats and Forestry are not triggered.

The preparation of the ESMPs involved road inspection and evaluation, document review, and consultation with stakeholders such as DFR, Ministry of Food and Agriculture, and Ministry of Health at the district levels as appropriate.

Policy, Legislative and Administrative Frameworks

The relevant policy, regulatory and legislative frameworks applicable to the sector and feeder road ESMP preparation and therefore considered included:

- Environmental and Social Management Framework of the Transport Sector Project (TSP);
- Ghana's Environmental Policy;
- Environmental Protection Agency Act, 1994;

- Environmental Assessment Regulations and Procedures;
- Environmental Assessment (Amendment) Regulations, 2002;
- Occupational Safety and Health Policy of Ghana (Draft);
- National Workplace HIV/AIDS Policy;
- The World Bank Requirements.

General Project and Zonal Information

All the alignments for the twenty nine (29) roads in the TCZ already exist, but in deplorable conditions. There are five (5) roads in Upper East Region, seven (7) each in the Upper West and Northern Regions, nine (9) in Brong Ahafo Region and one (1) in the northern Volta Region. Settlements, schools, farms and other rural infrastructure are located along some of the project routes. The maintenance works to be carried out are mainly spot improvement and minor rehabilitation as provided in Table 1 below. These works will, however, not affect any structure or facility within the corridor, since the RoW already exists.

The average length of the project roads is about 11.59km, with the longest and shortest being 40.08km and 3.5km respectively. The total length of the roads for the maintenance works is approximately 336km.

Table 1 Selected Roads for Maintenance in Tropical Continental Zone

No.	Road Name	Districts	Length (km)	Recommended Works
	Upper East Region			
1	Kaadi - Kaadi Junction	Bawku Municipality	12.0	Minor Rehabilitation
2	Navrongo – Nayagina – Mriegu	Kassena Nankana East	8.53	Spot Improvement
3	Aniisi – Kpatarigo	Bawku Municipality	8.7	Spot Improvement
4	Tempane – Yabrago – Warianga	Garu-Tempane	10.6	Minor Rehabilitation
5	Sapeliga – Gozongo	Bawku West	5.10	Spot Improvement
	Upper West Region			
6	Chala-Duu	Nadowli	27.7	Spot Improvement
7	Kandeo-Gurungu	Wa West	20.35	Spot Improvement
8	Kpari-Nawie	Lambussie	7.7	Minor Rehabilitation
9	Naabugubelle – Nwanduono	Sissala East	11.0	Spot Improvement
10	Pieng – Bujang	Sissala East	8.6	Spot Improvement
11	Tinniabelle – Sawbelle	Wa East	4.4	Minor Rehabilitation
12	Jeffisi-Timmie	Sissala West	6.5	Spot Improvement
	Northern Region			
13	Buipe-Kotito No. 3	Central Gonja	40.08	Spot Improvement
14	Sawla-Dagbewu	Sawla-Tuna-Kalba	25.80	Spot Improvement
15	Chibrinyo-Dugli	Bole	4.80	Spot Improvement
16	Wungu-Mishio	West Mamprusi	17.20	Spot Improvement
17	Bulbia-Kpasenkpe	West Mamprusi	11.40	Spot Improvement
18	Loagri-Prima	West Mamprusi	14.50	Minor Rehabilitation
19	Soo Junction-Soo	West Mamprusi	9.20	Spot Improvement
	Brong Ahafo Region			
20	Kupongkrom-Salamkrom-Kyekyewere, Yepimso Junction – Kyekyewere	Nkoranza South	13.5	Minor Rehabilitation
21	Weila-Gumboi-Dwere	Kintampo North Municipality	7.7	Spot Improvement
22	Kwametente-Jaro-Nsuhunu	Tain	9.6	Minor Rehabilitation

23	Subinso-Boase	Wenchi Municipality	4.4	Minor Rehabilitation
24	Sampano-Kwajilogo-KwakuDonkor	Tain	6.0	Minor Rehabilitation
25	Wrukwai Junction-Wrukwai-Kunsu	Kintampo North Municipality	9.1	Minor Rehabilitation
26	Hani-Namasa	Tain	6.6	Minor Rehabilitation
27	Namasa-Brohani	Tain	11.8	Minor Rehabilitation
28	Jinijini-Nifakwan	Berekum Municipality	9.7	Spot Improvement
	Volta Region			
29	Ahamansu-Dika	Kadjebi	3.50	Minor Rehabilitation
	Total		**336.06**	

Potential Impacts, Mitigation and Monitoring Measures

The main benefits of the projects will include enhanced mobility and access to market centres, efficient transportation, as well as reduced vehicle operating cost, reduced transportation cost and time and also CO_2 emissions. With the spot improvement works, farmers will be able to transport farm produce easily, reducing post harvest losses.

The potential adverse impacts for which relevant mitigation and monitoring measures have been provided include: water resource, drainage and erosion impacts, dust generation and air quality, temporary site office impacts, noise and vibration impacts, occupational health and safety and HIV/AIDS and STIs risks and waste generation as well as impacts of road diversion.

Mitigation measures include: culverts and drains designed with adequate capacity to direct and contain flows and run-off, to prevent overflow and road embankment erosion; excavated and heaped materials retained in confinements and located 10 meters (minimum distance) away from water bodies and drainage channels; covering of all flyable materials; agreement between the contractor and owner of land identified for erection of site office; use of noise protection devices and limiting time of exposure; water dousing, speed control limits and ramps; training and strict schedule of maintenance/servicing of machinery; use of personal protective equipment (PPE); provision of first aid kits as well as erection of warning signs; sensitization and awareness on transmission and prevention of HIV/AIDS and STIs; composting and segregation of waste and maintaining high hygienic standards. In addition to mounting warning signs and directing traffic near culvert construction sites, barricades will also be mounted to protect workers.

Monitoring will check the effectiveness of mitigation and erosion prevention measures, material losses into and contamination of water bodies; records of machinery maintenance schedules; noise and vibration exposure levels and duration; water dousing and speed control; fulfilment of the terms of agreement on use of site for project office; records of injury and clinic attendance cases, use and state of PPEs; HIV/ AIDS awareness programs effectiveness; state of toilets and segregation of waste; and mounted road signs and traffic direction.

Environmental and Social Management Plan Implementation

The general outline of the ESMP implementation by the various actors will involve the following stages:

- ESMP preparation and approval;
- Contract specifications on E&S safeguards obligations;
- Rehabilitation/project contract award;
- E&S safeguards implementation plan and schedule;
- Rehabilitation/project commencement;

- Capacity building on E&S safeguards (and other awareness programme);
- E&S safeguards and mitigation implementation;
- Monitoring of safeguard/mitigation measures;
- Reporting; and
- Compliance and other periodic verification monitoring.

The main environmental and social safeguard measures in the ESMPs are:

- Water resources, erosion control and flood prevention management;
- Noise and vibration exposure management;
- Dust control management;
- Public and occupational health and safety management;
- HIV/AIDS and health awareness management;
- Waste management;
- Road diversion and accident prevention; and
- Temporary use of site for project office and reinstatement

The key actors in the implementation of the ESMPs include:

- The contractor- to be awarded the rehabilitation contract and be required to implement the environmental and social safeguard measures;
- DFR - to ensure that E&S safeguards and other mitigation measures are duly implemented;
- EPA - to ensure compliance with the ESMP and other relevant approval conditions;
- MRH - to oversee the effective implementation of the road project and related E&S safeguards; and
- MEST - to address complaints of any aggrieved parties on E&S safeguards, especially with respect to 'unfavourable' decisions of the EPA.

The other components of the ESMPs include capacity building, proposed implementation budget and E&S safeguards obligations of contractors. Capacity building mainly on E&S safeguards planning, implementation and supervision, monitoring and reporting, and also public and occupational E&S and health (including HIV/AIDS) awareness and waste management have been prepared to enhance the capacity of DFR District Engineers, Contractors and their Site Engineers/Foremen as well as selected members of nearby communities.

A proposed budget of $514,220.00 to facilitate implementation of the various measures, monitoring plan and capacity building in the ESMP has been made as an integral part of financing for the rehabilitation/maintenance works. The specific E&S safeguards obligations for the contractor to be incorporated into the contract specifications are also provided, as well as other contractual provisions made in the General Items of the Bills of Quantities.

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1.0 INTRODUCTION

1.1 Background

Under the Transport Sector Project (TSP) by the then Ministry of Transportation (now Ministry of Roads and Highways), an Environmental and Social Management Framework (ESMF) and a Resettlement Policy Framework (RPF) were prepared for the road transport sector in 2008. The ESMF and the RPF provide the means to addressing the environmental and social impacts and other safeguards requirements of projects to be financed under the TSP, when they are due for implementation.

Currently, eighty-four (84) feeder roads have been selected for rehabilitation/maintenance works throughout the country under the TSP. The provisions of the ESMF require the preparation of an Environmental and Social Management Plan (ESMP) for each of the selected roads, given that the roads are in use and benefit from rehabilitation works from time to time. The country has been divided into four zones base on eco-climatic variations namely: the Tropical Continental, South-Western Equatorial, Wet-Semi Equatorial and the Dry Equatorial zones for purposes of grouping the planned rehabilitation / maintenance works. The Tropical Continental Zone (TCZ) which comprises the Upper East, Upper West, Northern, Brong Ahafo and northern Volta is expected to benefit from the maintenance works of 29 feeder roads. This report covers the ESMPs for the selected 29 feeder roads in the TCZ.

The feeder roads network size in the Upper East Region is 2,156km in total. Out of this 1,313km is engineered; 487km is partially engineered; while 357km is unengineered. In terms of the surface type of these roads: 1,449km classified as good; 527.80km classified as fair; while 178.50km is classified as poor.

The feeder roads network size in the Upper West Region is 3,201.24km in total. Out of this 1,738.11km is engineered; 638.08km is partially engineered; while 825.00km is unengineered. In terms of the surface type of these roads: 1,504.92km classified as good; 850.54km classified as fair; while 845.74km is classified as poor.

The feeder road network size in the Northern Region is given as 6,456.28km in total. Out of this 2,948.52km is engineered; 2,523.21km is partially engineered; while 984.55km is unengineered. In terms of the surface type of these roads: 2.475.88km classified as good; 2,665.90km classified as fair; while 1,314.50km is classified as poor.

The feeder roads network size in the Brong Ahafo Region 3,338km in total. Out of this 2,273km is engineered; 467km is partially engineered; while 597km is unengineered. In terms of the surface type of these roads: 567.46km classified as good; 1,435.34km classified as fair; while 1,335.2km is classified as poor.

The feeder road network size in the Volta Region is approximately 3,338km in total. Out of this 2,273km is engineered; 467km is partially engineered; while 597km is unengineered. In terms of the surface type of these roads: 567.46km classified as good; 1,435.34km classified as fair; while 1,335.20km is classified as poor. It is only one (1) road within the region which falls in TCZ.

Feeder roads regularly undergo maintenance works given that they are often not tarred and susceptible to rapid deterioration. The main object of the proposed maintenance works is to improve the road condition to reduce travel time and enhance interconnection between the adjoining communities.

The nature and scale of the rehabilitation/maintenance works are rather limited and within the existing right of way (RoW). The likely environmental and social impacts will also be localised and mainly temporary, with known and easy to apply mitigation and management measures. No land outside the RoW or property, building or any structure will be affected by the road works, therefore no compensation or resettlement will be required. Also no sensitive sites or resources such as forest reserve, sacred grove, cemetery, shrine or other places of historical and cultural interests are within or near the RoW of any of the 29 roads earmarked for maintenance. Furthermore, the maintenance works will not affect any utility lines such as water, electricity or telecommunication lines. Thus, the World Bank's Policy on Involuntary Resettlement, Management of Cultural Property, Conservation of Natural Habitats and Forestry are not triggered.

1.2 Objectives of the ESMPs

Environmental and Social Management Plans (ESMPs) are required for the roads in line with the ESMF. ESMPs are usually prepared for existing projects (undertakings/) in accordance with Ghana's Environmental Assessment (EA) Regulations (LI 1652, Section 24).

The purpose of the ESMP is to:

- Reduce the potential adverse environmental and social impacts of the required maintenance /rehabilitation works;
- Facilitate monitoring and enhancement measures as contribution to environmental and social performance during implementation;
- Provide institutional strengthening measures for effective supervision; as well as
- Ensure compliance with the safeguards requirements of the projects, in line with the ESMF.

1.3 Methodology for the ESMP

The ESMP preparation involved field visits to the project sites, document review and consultation with key representative stakeholders at the national, regional and district levels. The main national and the World Bank reference documents reviewed included:

- Environmental and Social Management Framework for TSP (2008);
- Resettlement Policy Framework for the TSP;
- Environmental Protection Agency Act, 1994 (Act 490);
- Environmental Assessment Regulations, 1999 (LI 1652);
- Environmental Assessment (Amendment) Regulations, 2002 (LI 1703);
- National Environmental Action Plan;
- Ghana EIA Procedures; and
- World Bank's Environmental and Social Safeguards Policies (OP/BP 4.01 and OP/BP 4.12).

The national and regional level institutions involved in the ESMP processes were the EPA and the DFR. The district engineers of the relevant DAs were also consulted. Three sets of data capture forms were used as guidelines for conducting individual road project assessments. A sample of the data capture form is attached in Appendix I. The forms capture data on the following:

- Project description (i.e. for the specific feeder roads);
- Project corridor and adjoining area (baseline) information; and
- Potential impacts (environmental and social) of the project (road works & borrow pits).

The scope/structure of the Tropical Continental Zone report covers the following:

- Policy, legislative/regulatory and administrative frameworks;
- Zonal (baseline) information on the feeder roads;
- Beneficial and adverse impacts for specific project roads;
- Mitigation measures for the project roads;
- Monitoring plan;
- Environmental and social management implementation plan and budget; and
- Public consultations and disclosure.

The methodology took into account provisions made in the General Items of the Bills of Quantities (BoQ), which are incorporated into contracts by the DFR.

1.4 Organization of Report

This report contains thirty-four (34) main sections, preceded by the executive summary. The main sections are:

- Chapters One, Two and Three: General introduction to the ESMPs; overview of applicable legal, policy and administrative frameworks; and general project zonal information;
- Chapter Four to Eight – Assessment of each of the five (5) project roads in the Upper East Region;
- Chapter Nine to Fifteen – Assessment of each of the seven (7) project roads in the Upper West Region;
- Chapter Sixteen to Twenty Two – Assessment of each of the seven (7) project roads in the Northern Region;
- Chapter Twenty Three to Thirty One – Assessment of each of the nine (9) project roads in the Brong Ahafo Region;
- Chapter Thirty Two – Assessment of the project road in the Volta Region;
- Chapter Thirty Three – Implementation of ESMPs and associated budget; and
- Chapter Thirty Four – Consultations with stakeholders.

2.0 POLICY, LEGISLATIVE AND ADMINISTRATIVE FRAMEWORKS

The principal policies, laws and procedures on ESMP and related requirements which guided preparation of the ESMP are presented below:

1) The national environmental requirements -
    a. Ghana's Environmental Policy;
    b. Environmental Protection Agency Act, 1994;
    c. Environmental Assessment Regulations and Procedures; and
    d. Environmental Assessment (Amendment) Regulations, 2002.

2) The national land, labour, safety and health requirements -
    a. Lands Statutory Wayleaves Act, 1963;
    b. Factories, Offices and Shops Act, 1970;
    c. Occupational Safety and Health Policy of Ghana (Draft);
    d. National Workplace HIV/AIDS Policy;
    e. Labour Act, 2003; and
    f. Youth Employment Implementation Guidelines.

3) Environmental and Social Management Framework - Ghana Transport Sector Program (TSP).
4) The World Bank Requirements -
    a. Environmental Assessment (OP 4.01);
    b. Management of Cultural Property (OPN 11.03);
    c. Conservation of Natural Habitats (OP 4.04**)**; and
    d. Forestry (OP/BP 4.36).

2.1 National Environmental Requirements

2.1.1 Ghana's Environmental Policy

The environmental policy of Ghana formulated in the National Environmental Action Plan (NEAP) of 1993 hinges strongly on 'prevention' as the most effective tool for environmental protection. The policy aims at a sound management of resources and environment, and the reconciliation between economic planning and environmental resources utilization for sustainable national development. Within this context and in relation to the road transport sector, the policy also seeks among others, to institute an environmental quality control and sustainable development programs by requiring prior EA (including environmental and social management) of all developments, and to take appropriate measures to protect critical eco-systems, including the flora and fauna they contain against harmful effects, nuisance or destructive practices. The adoption of the NEAP led to the enactment of the EPA Act 1994 (Act 490); and subsequently the passing of the Ghana EIA Procedures into the EA Regulations, 1999 (LI 1652).

2.1.2 Environmental Protection Agency Act, 1994

The Environmental Protection Agency (EPA) Act, 1994 (Act 490) grants the Agency enforcement and standards setting powers, and the power to ensure compliance with the Ghana EA requirements/procedures. The Agency (including its Regional and District Offices) is also vested with the power to determine what constitutes an 'adverse effect on the environment' or an activity posing 'a serious threat to the environment or public health', to require EAs, ESMPs, AERs, etc of an 'undertaking', including road transport sector projects, to regulate and serve an enforcement notice for any offending or non-complying undertaking.

The Agency is required to conduct monitoring to verify compliance with permit conditions for project and mitigation commitments. Furthermore, a requirement by EPA for an EA precludes any authorising MDA from licensing, permitting, approving or consenting such undertaking, unless notified otherwise.

2.1.3 Environmental Assessment Regulations and Procedures

The Environmental Assessment (EA) Regulations combine both an environmental assessment and environmental management systems. The EA considers environmental and social aspects in an integrated way. The regulations prohibit commencing an "undertaking" (including road transport sector projects) without prior registration and environmental permit. Undertakings are grouped into schedules to enable registration and securing environmental permit from the EPA through the EA system.

The Regulations also define the relevant stages and actions certification, ESMP, AER, suspension/revocation of permit, complaints/appeals, etc.

2.1.4 Environmental Assessment (Amendment) Regulations, 2002

The Environmental Assessment (Amendment) Regulations, 2002 (LI 1703) were made to amend sections of the EA fees regime of LI 1652 (the 'principal enactment') on processing charges, payment for environmental permit and certificates (for ESMPs) issued by the Agency.

2.2 National Land, Labour, Safety and Health Requirements

2.2.1 Lands Statutory Wayleaves Act, 1963

The Lands Statutory Wayleaves Act 1963 (Act 186) was enacted to facilitate the entry on any land for the purposes of construction, installation and maintenance of public utility works and creation of right of ways and other similar right for such works. Works for which right of ways may be created are "feeder roads or works for purposes of, or in connection with any public utility works". The Act and its accompanying Regulations, the Lands Statutory Wayleave Regulations 1964 (LI 334) provides the modalities and procedures for the acquisition of the Statutory right of ways. Thus, the mechanism for entry for survey works and construction has been spelt out in details. Provision has also been made for restoration of affected lands where that is possible.

2.2.2 Factories, Offices and Shops Act, 1970

The Factories, Offices and Shops Act of 1970 (Act 328) mandates the Factories Inspectorate Department to register factories and ensure that internationally accepted standards of providing safety, health and welfare of persons are adhered to. It defines a factory to include any premises (whether in or not in a building) in which one or more persons are employed in manual labour, among others. The Act spells out the responsibilities of the employer in ensuring a safe and healthy work environment so as to guarantee the health and safety of employees. In this respect, the Act makes provision for the protection of the workforce that will be involved in the road construction activities.

2.2.3 Occupational Safety and Health Policy of Ghana (Draft)

The policy statement of the OSH Policy (draft 2004) is: 'to prevent accidents and injuries arising out of or linked with or occurring in the course of work, by minimizing, as far as reasonably practicable, the cause of the hazards in the working environment and, therefore, the risk to which employees and the public may be exposed'. The policy is derived from provisions of the International Labour Organization (ILO) Conventions 155 and 161. The policy document has specific sections on objectives, scope, strategies, activities and promotion and awareness creation.

2.2.4 National Workplace HIV/AIDS Policy

The broad objectives of the policy among others, are to provide protection from discrimination in the workplace to people living with HIV and AIDS; prevent HIV and AIDS spread amongst workers; and provide care, support and counselling for those infected and affected.

2.2.5 Labour Act, 2003

The purpose of the Labour Act, 2003 (Act 651) is to amend and consolidate existing laws relating to labour, employers, trade unions and industrial relations. The Act provides for the rights and duties of employers and workers; legal or illegal strike; guarantees trade unions and freedom of associations, and establishes the Labour Commission to mediate and act in respect of all labour issues. Under Part XV (Occupational Health, Safety and Environment), the Act explicitly indicates that it is the duty of an employer to ensure that every worker works under satisfactory, safe and healthy conditions.

2.2.6 Youth Employment Implementation Guidelines

The authority for decision-making on the implementation of the National Youth Employment Program (NYEP) resides in the Ministry of Employment and Social Welfare, through a National Employment Task Force (NETF) set up to implement the program. District Employment Task Forces set up are made accountable to the NETF in all their undertakings throughout the implementation of the program.

The overall objective of the program is to empower the youth to be able to contribute more productively towards the socio-economic and sustainable development of the nation. The specific objectives of the Program include checking the drift of the youth from the rural to urban communities in search of jobs by creating those opportunities in the rural areas, etc.

2.3 Environmental and Social Management Framework

The Environmental and Social Management Framework (ESMF), sponsored by the World Bank was prepared for the Ghana Transport Sector Program (TSP). The ESMF provides a corporate environmental and social safeguard policy framework, institutional arrangements, and capacity available to identify and mitigate potential safeguard issues and impacts of each sub-project. The ESMF was designed to address potential adverse environmental and social impacts at the planning stage of the feeder roads' maintenance works.

This ESMF defines management procedures to avoid causing harm or exacerbating social tension, and to ensure consistent management of environmental and social issues during feeder roads maintenance works.

2.4 The World Bank Requirements

2.4.1 The Bank's Safeguard Policies

The Bank's safeguard policies are designed to help ensure that programs proposed for financing are environmentally and socially sustainable, and thus improve decision-making. The Bank's Operational Policies (OP) are meant to ensure that operations of the Bank do not lead to adverse impacts or cause any harm. The relevant ones to this work include:

- Environmental Assessment (OP 4.01);
- Management of Cultural Property (OPN 11.03);
- Conservation of Natural Habitats (OP 4.04**)**; and
- Forestry (OP/BP 4.36).

2.4.2 Environmental Assessment (OP 4.01)

The OP 4.01 requires among others that screening for potential impacts is carried out early, in order to determine the level of EA to assess and mitigate potential adverse impacts. The Bank's project screening criteria group projects into three categories:

- Category A – Detailed Environmental Assessment;
- Category B - Initial Environmental Examination; and
- Category C – Environmentally friendly.

The EA ensures that appropriate levels of environmental and social assessment are carried out as part of project design, including public consultation process, especially for Category A and B projects. The OP 4.01 is triggered if a program is likely to present some risks and potential adverse environmental impacts in its area of influence. The OP 4.01 is applicable to all components of the Bank's financed projects, even for co-financed components.

Considering the rather limited scale and nature of the proposed maintenance works on the feeder roads, and the potential low magnitude and localized environmental and social impacts of the project, the proposed feeder roads maintenance works are classified category 'B'.

3.0 GENERAL PROJECT AND ZONAL INFORMATION

The proposed works forms part of DFR's ongoing rehabilitation/maintenance activities which aims at improving access and mobility to and from the beneficiary communities and the districts in the zone. There are twenty nine (29) selected roads in the tropical continental climate zone. Five (5) roads in Upper East Region, seven (7) each in the Upper West and Northern Regions, nine (9) in Brong Ahafo Region and one (1) in the northern Volta Region. All the selected roads already exist, but are in deplorable conditions. Settlements, schools, farms and other rural infrastructure are located along some of the project routes. The maintenance works to be carried out are mainly spot improvement and minor rehabilitation as provided in Table 3.1 below. These works will, however, not affect any structure or facility within the corridor, since the RoW already exists.

The average length of the project roads is about 11.59km, with the longest and shortest being 40.08km and 3.5km respectively. The total length of the roads for the maintenance works is approximately 336km.

Table 3. 1 Proposed Roads for Maintenance in Tropical Continental Zone

No.	Road Name	Districts	Length (km)	Recommended Works
	Upper East Region			
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12	Jeffisi-Timmie	Sissala West	6.5	Spot Improvement
	Northern Region			
13	Buipe-Kotito No. 3	Central Gonja	40.08	Spot Improvement
14	Sawla-Dagbewu	Sawla-Tuna-Kalba	25.80	Spot Improvement
15	Chibrinyo-Dugli	Bole	4.80	Spot Improvement
16	Wungu-Mishio	West Mamprusi	17.20	Spot Improvement
17	Bulbia-Kpasenkpe	West Mamprusi	11.40	Spot Improvement
18	Loagri-Prima	West Mamprusi	14.50	Minor Rehabilitation
19	Soo Junction-Soo	West Mamprusi	9.20	Spot Improvement
	Brong Ahafo Region			
20	Kupongkrom-Salamkrom-Kyekyewere, Yepimso Junction – Kyekyewere	Nkoranza South	13.5	Minor Rehabilitation
21	Weila-Gumboi-Dwere	Kintampo North Municipality	7.7	Spot Improvement
22	Kwametente-Jaro-Nsuhunu	Tain	9.6	Minor Rehabilitation
23	Subinso-Boase	Wenchi Municipality	4.4	Minor Rehabilitation

24	Sampano-Kwajilogo-KwakuDonkor	Tain	6.0	Minor Rehabilitation
25	Wrukwai Junction-Wrukwai-Kunsu	Kintampo North Municipality	9.1	Minor Rehabilitation
26	Hani-Namasa	Tain	6.6	Minor Rehabilitation
27	Namasa-Brohani	Tain	11.8	Minor Rehabilitation
28	Jinijini-Nifakwan	Berekum Municipality	9.7	Spot Improvement
	Volta Region			
29	Ahamansu-Dika	Kadjebi	3.50	Minor Rehabilitation
	Total		**336.06**	

3.1 Project Description

Spot Improvement

Spot improvement works basically involves maintenance of specific spots of the road that are in bad shape and thus impedes easy transportation. This may include construction of culverts, sectional gravelling, sectional levelling, etc.

Minor Rehabilitation

This usually involves rehabilitation of the entire stretch of the road. The activities undertaken are similar to that of spot improvement works but the extent of works differs. The extent of works in minor rehabilitation activities are more involving than in spot improvement. Such works includes clearing, formation activities, blading, gravelling, culvert construction and drain cleaning.

3.2 Tropical Continental Climatic Zone Information

The Upper East Region occupies a total land area of about 8,842 sq km, which translates into 2.7 per cent of the total land area of the country. The land is relatively flat with a few hills to the East and southeast. The natural vegetation is that of the savannah woodland characterised by short scattered drought-resistant trees and grass that gets burnt by bushfire or scorched by the sun during the long dry season. The climate is characterized by one rainy season from May/June to September/October. The mean annual rainfall during this period is between 800 mm and 1.100 mm. The rainfall is erratic spatially and in duration. There is a long spell of dry season from November to mid February, characterized by cold, dry and dusty harmattan winds. Temperatures during this period can be as low as 14 degrees centigrade at night, but can go to more than 35 degrees centigrade during the daytime. Humidity is however, very low making the daytime high temperature less uncomfortable.

Agriculture, hunting and forestry are the main economic activities in the region. About eighty per cent of the economically active population engages in agriculture. The main produce are millet, guinea-corn, maize, groundnut, beans, sorghum and dry season tomatoes and onions.

Livestock and poultry production are also important. There are two main irrigation projects, the Vea Project in Bolgatanga covering 850 hectares and the Tono Project in Navrongo covering 2,490 hectares. Altogether they provide employment to about 6,000 small-scale farmers. Other water-retaining structures (dams and dugouts) provide water for both domestic and agricultural purposes.

The total length of feeder roads in the region is 2,156km. Out of this 1,313km is engineered; 487km is partially engineerd and 357km is unengineered. In terms of the surface type of these roads:

a) 20.0km is Bitumen surface;

b) 1287.0km is Gravel surface; and
c) 849.0km is Earth surface.

The road conditions are classified as follows:

a) 1,449.0km classified as good;
b) 527.8.0km classified as fair; and
c) 178.5.0km is classified as poor.

The Upper-West covers an area of approximately 18,478 square kilometres, which is about 12.7 per cent of Ghana's total land area. The region is located in the guinea savannah vegetation belt. The vegetation consists of grass with scattered drought resistant trees such as the shea, the baobab, dawadawa, and neem trees. The heterogeneous collection of trees provides all domestic requirements for fuel wood and charcoal, construction of houses, cattle kraals and fencing of gardens. The shorter shrubs and grass provide fodder for livestock. The temperature of the region is between a low of 15^0C at night time during the harmattan season and a high of 40^oC in the day during the hot season.

The total length of feeder roads in the region is 3,201.24km. Out of this 1,738.11km is engineered; 638.08km is partially engineered; while 825.00km is unengineered. In terms of the surface type of these roads:

a) 23.35km is Bitumen surface;
b) 2,412.89km is Gravel surface; and
c) 764.85km) is Earth surface.

The road conditions are classified as follows:

a) 1,504.92km classified as good;
b) 850.54km classified as fair; while
c) 845.74km is classified as poor.

The Northern Region, which occupies an area of about 70,383 square kilometres, is the largest region in Ghana in terms of land area. The land is mostly low lying except in the north-eastern corner with the Gambaga escarpment and along the western corridor. The region is drained by the Black and White Volta and their tributaries, Rivers Nasia, Daka, etc. The climate of the region is relatively dry, with a single rainy season that begins in May and ends in October. The amount of rainfall recorded annually varies between 750mm and 1050mm. The main vegetation is classified as vast areas of grassland, interspersed with the guinea savannah woodland, characterized by drought-resistant trees such as the acacia, baobab, shea nut, dawadawa, mango, neem. The bulks (71.2%) of the economically active population in the region are employed in agriculture. Only 5.7 per cent of the workforce is made up of professionals, administrative or clerical staff. The rest (23.1%) are in sales, services, and transport and production.

The feeder road network size in the region is given as 6,456.28km in total. Out of this 2,948.52km is engineered; 2,523.21km is partially engineered; while 984.55km is unengineered. In terms of the surface type of these roads:

a) 4.70km (0.07%) is Bitumen surface;
b) 3,755.70km (58.17%) is Gravel surface; and
c) 2,695.88km (41.76%) is Earth surface.

The road conditions are classified as follows:

a) 2.475.88km (38.35%) classified as good;
b) 2,665.90km (41.29%) classified as fair; while
c) 1,314.50km (20.36%) is classified as poor.

The Brong Ahafo Region covers an area of approximately of 39,557 square kilometres, which is about 16.6per cent of Ghana's total land area. The region has a tropical climate, with high temperatures averaging 23.9°C (750F) and a double maxima rainfall pattern. Rainfall ranges, from an average of 1000 millimetres in the northern parts to 1400 millimetres in the southern parts. The region has two main vegetation types, the moist semi-deciduous forest, mostly in the southern and south-eastern parts, and the guinea savannah woodland, which is predominant in the northern and north-eastern parts of the region. The level of development and variations in economic activity are largely due to these two vegetation types.

The total length of feeder roads in the region is 7,386.02km. Out of this 4,358.64km is engineered; 778.43km is partially engineered; while 2,248.95km is unengineered. In terms of the surface type of these roads:

a) 113km is Bitumen surface;
b) 3,717.37km is Gravel surface; and
c) 3,555.65km is Earth surface.

The road conditions are classified as follows:

a) 2,548.72km classified as good;
b) 1,736.02km classified as fair; while
c) 3,101.22km is classified as poor.

The Volta Region is located along the southern half of the eastern border of Ghana, which it shares with the Republic of Togo. Greater Accra, Eastern and Brong Ahafo regions share boundaries with it on the west, on the north by the Northern Region, and on the south by the Gulf of Guinea. The region occupies an area of about 20,570 square kilometres or 8.6 percent of the total land area of Ghana. The region has a length of about 500 kilometres, stretching from the south to the north. It encompasses most of the vegetation zones found in the country, that is, the coastal grassland and mangrove swamps, replete with sandy beaches, the guinea savannah through moist semi-deciduous forests in the central highland areas to the undulating Sahel-savannah and the mountainous wooded savannah in the north.

Out of the economically active population, 92.5 per cent are employed in various industries, with 7.5 per cent unemployed. The rate of unemployment is highest in Kpandu (11.1%), followed by Jasikan (10.4%) and Ho (10.5%). The rest of the districts have a single digit unemployment rate ranging from 3.4 per cent for Nkwanta, to 9.7 per cent for Hohoe. The rate of unemployment is higher among females than males in seven of the 15 districts. Students constitute (31.1%) of the non-economically active population in the region. Workers in the agricultural and related occupations are in the majority in all the districts. Agriculture remains the largest industry in the region and in the districts, except Keta and Krachi, districts where fishing is the main and the second industry respectively.

The total feeder road network size in the region is 3,338km. Out of this 567.46 (17%) is classified as good, 1,435.34km (43%) is classified as fair and 1,335km (40%) is classified as poor. 567.46km is engineered; 467km is partially engineered; while 597km is unengineered. In terms of the surface type of these roads:

a) 195km is bitumen surface;
b) 2,085km is gravel surface; and
c) 1,058km is earth surface.

ROADS IN UPPER EAST REGION

4.0 KAADI JUNCTION - KAADI MINOR REHABILITATION PROJECT

4.1 Project Environment Information

This project road is located in the Bawku Municipality, about 15km from Bawku, the municipal capital. The road is 12.0km long and it serves the Kaadi, Binduri and Kugri communities.

Houses along the road corridor are about 100m away from the road. There is also a primary school about 100m from the road.

The vegetation type is grassland with farmlands and grazing lands. The road crosses one river namely, River Kobribok. The topography is generally flat.

4.2 Project Description

The current state of the road is in a poor condition. The surface has developed soft spots, though it benefitted from some routine maintenance works in 2007. The width of the road remains 6.0m on the average.

The objective of the proposed minor rehabilitation works includes among others to provide shorter route to Kugri, facilitating easy transportation of agricultural produce and people living within the road corridor to the nearest market centre.

The specific works intended to be carried out are mainly clearing, sectional gravelling, construction of culverts, and stone pitching. The specific works (according to mileage (location) and/or distance) are provided in the Table 4.1 below.

Table 4. 1 Locations of Specific Works along the Kaadi - Kaadi Junction Road

	Specific Works	Location or Distance
1	Clearing	km 0+000 -12+000
2	Sectional gravelling	km 0+000 -12+000
3	Construction of culverts	km 0+000 -12+000
4	Stone pitching	km 0+000 -12+000

Other works will involve formation and excavations for gravel in borrow pits, spreading and laying and compacting.

The sizes and numbers of culverts are as follows:

a) 5 No. 900x700;
b) 4 No. 900x1200; and
c) 1 No. 2x2 box.

The list of types and numbers of equipment/machinery to be used include:

a) 1 No. Bulldozer;
b) 1 No. Grader;
c) 1 No. Roller;
d) 1 No. Water dowser; and
e) 2 No. Concrete mixers.

The raw materials and the estimated quantity will be:

a) gravel (sub-base): 39,960m^3,

b) Sand: 1048.6m^3, and
c) Chippings: 16964.7m^3.

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated that a workforce of about twenty four (24) persons will be employed for the project. The project implementation will take about nine (9) months.

4.3 Potential Impacts, Mitigation and Monitoring Measures

Routine maintenance works were carried out on the Kaadi Junction–Kaadi Road in 2007. The current proposed minor rehabilitation project is part of regular on-going road works to improve and maintain access in the Kaadi, Binduri and Kugri communities in particular, and the Bawku Municipality in general.

The right of way (RoW) already exists. Although the effective width of the road remains at the standard 6.0m, the road surface is in bad shape. The proposed works will mainly involve clearing of savannah grass within the RoW, graveling and filling and construction of a culvert at the Kobribok River crossing.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety hazards;
5. HIV/AIDS spread;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

4.3.1 Water Resources Impacts, Mitigation and Monitoring

The road crosses the River Kobribok. This is an important water body to communities and farmers whose farms are close to it as a main water supply source. It also serves sometimes for minor irrigation purpose and for livestock watering. It sometimes dries up in the dry season, but in floods in the wet season. Due to the flat nature of the land, large areas become inundated when in floods.

The construction of a culvert across the Kobribok will entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the water course and silt up the waterbed as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size to direct and contain the Kobribok River, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs. Clearing of grass along the corridor from Kaadi Junction to Kaadi will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered.

Excavated materials will be retained away from the river and covered, to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the River Kobribok:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

4.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 12.0km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt mainly by some of the twenty four (24) workers. The effect of noise on communities, however, will be minimal, since the closest house to the corridor is about 100m away.

Impact of noise will be localised at the operational sites on workers. Noise protection devices such as ear muffs and plugs will be provided to all workers on site. The use of the protection device by workers will be mandatory at all work sites. The contractor or designated supervisor will be accountable for any instance of non-compliance.

Workers operating noisy and vibrating machines will not be allowed to work for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and available for inspection to ensure optimal noise generation. Idle equipment will immediately be shut down.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

4.3.3 Dust Generation and Air Quality Impacts, Mitigation and Monitoring

Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. The use of diesel powered equipments, such as the bulldozer, grader and excavator can also affect air quality. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since the closest house to the corridor is about 100m away.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control ramps will be erected along the road to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. When transporting construction materials, trucks will be covered with tarpaulin to prevent the flying of aggregates and sand. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and

- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

4.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

4.3.5 Potential Spread of HIV/AIDS and STIs Prevention and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

4.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

4.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

4.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 9 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;

- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

5. 0 NAVRONGO-NAYAGNIA-MIRIEGU SPOT IMPROVEMENT PROJECT

5.1 Project Environment Information

This project road is located in the Kassena Nankana East District and is located about 2km from the Navrongo, the district capital. The road is 8.53km long and serves the Nayagnia and Miriegu communities.

There are houses along the road corridor, ranging from 30m to 100m to the road corridor. There is a primary school 30m from the road, a clinic about 5m from the road and farms about 10m from the road.

The vegetation type is grass with farmlands and grazing lands. The road crosses two river bodies namely, rivers Akulaa and Kuningi, and the Nayere stream tributaries. The topography is generally flat.

5.2 Project Description

The road has soft spots and washouts, giving it poor surface conditions. The width of the road remains 6.0m on the average.

The objective of the proposed spot improvement works includes providing shorter route to Navrongo, and facilitating easy transportation of agricultural produce and people living within the road corridor.

The specific works intended to be carried out are mainly the construction of box culvert for major river crossing and gravelling of sections. The specific works (according to mileage (location) and/or distance) are provided in the Table 5.1 below.

Table 5. 1 Locations of Specific Works along the Navrongo – Nayagina – Mriegu Road

	Specific Works	Location or Distance
1	Clearing	0+000-8+530
2	Sectional gravelling	0+200-4+330
3	Construction of culverts	0+000-7+000
4	Stone pitching	0+650-5+100

Other works will involve clearing grass, formation and excavation for gravel in borrow pit, spreading and laying and compacting.

The sizes and numbers of culverts to be constructed are as follows:

a) 9 No. 1200x900;
b) 3N0. 3x3 box;
c) 5 No. 900x700; and
d) 2 No. 1250x1800.

The list of types and numbers of equipment/machinery to be used include:

a) 1 No. Grader;
b) 1 No. Roller;
c) 1 No. Water dowser; and
d) 1 No. Concrete mixers.

The raw material and the estimated quantity will be:

a) gravel (sub-base): 8160 m^3;
b) Sand: 2873 m^3; and

c) Chippings: 33121 m^3.

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated that a workforce of about 20 persons will be employed for the project. The project implementation will take about twelve (12) months.

5.3 Potential Impacts, Mitigation and Monitoring Measures

Records of maintenance works on the Navrongo-Nyagnia-Merigu road are not available. The current proposed Spot Improvement project is part of regular on-going road works to improve and maintain access in the Nayagnia and Miregu communities in particular, and the Kessena Nankana East District in general.

The right of way (RoW) already exists. The effective width of the road still remains the standard 6.0m. The proposed road works will mainly involve clearing of savannah grass within the RoW, gravelling and filling and construction of culverts along the drainage channels and at the Nayere stream tributaries crossings.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members.

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety;
5. HIV/AIDS and STI spread;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

5.3.1 Impacts on Water Resources, Mitigation and Monitoring

The project road crosses the Akulaa and Kuningi rivers and the Nayere stream tributaries which are very important water bodies for communities along the banks. It also serves sometimes for minor

irrigation purpose and for livestock watering. It sometimes dries up in the dry season, but floods in the wet season. Due to the flat nature of the land, large areas become inundated when in floods.
The construction of culverts across Akulaa and Kuningi rivers and the Nayere stream tributaries will entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the water course and silt up the waterbed as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery near water bodies could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size to direct and contain the Akulaa and Kuningi rivers and the Nayere stream tributaries, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs. Clearing of grass along the corridor from Navrongo through Nyagnia to Merigu will be restricted to the right of way (RoW), and road works will progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered.
Excavated materials will be retained away from the river and covered, to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the water bodies
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

5.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 8.53km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt mainly by some of the twenty (20) workers and the clinic which is 5m from the road.

Also the primary school located 30m from the road could also suffer from excessive noise during school hours. The effect of noise on communities, however, will be minimal, since the closest house to the corridor is about 30m away.

Impact of noise will be localised at the operational sites on workers. Noise protection devices such as ear muffs and plugs will be provided to all workers on site. The use of the protection device by workers will be mandatory at all work sites. The contractor or designated supervisor will be accountable for any instance of non-compliance. Workers exposed to loud noise and vibration will not be allowed to work for not more than three (3) hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure optimal noise generation. Idle equipment will immediately be shut down. Works close to schools would be done after school hours. The static machines will be sited at least 100m away from clinics or homes to reduce their impacts. Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

5.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Land clearing for the entire 8.53km stretch from Navrongo through Nyagnia to Merigu, haulage of material by trucks, sectional gravelling between 0.2km and 4.33km and compaction are all dust generating activities. The use of diesel powered equipment, such as the bulldozer, grader and excavator can also affect air quality. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site. Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The clinic which is 5m from the road will also suffer from dust and emission. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since the closest house to the corridor is about 30m away.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control ramps will be erected along the road and especially around the clinic area to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. When transporting construction materials, trucks will be covered with tarpaulin to prevent the flying of aggregates and sand. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;

- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

5.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

5.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

5.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

5.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

5.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 12 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;

- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

6.0 ANIISI-KPATARIGO SPOT IMPROVEMENT PROJECT

6.1 Project Environment Information

This project road is located in the Bawku Municipality about 25km from Bawku, the municipal capital. The road is 8.7km long and it serves the Aniisi and Kpatarigo communities.

There are houses and farmlands along the road corridor, about 40m from the road. There is a primary school at 100m and a market at 50m from the road.

The vegetation type is savannah grassland which is used as farmlands and grazing lands. The topography is generally flat.

6.2 Project Description

The road has soft spots and washouts giving it poor surface conditions. The width of the road remains 6.0m on the average.

The objective of the proposed spot improvement works includes providing access to farms and facilitating easy transportation of agricultural produce to market centres.

The specific works intended to be carried out are mainly culverts construction and sectional gravelling. The specific works (according to mileage (location) and/or distance) are provided in the Table 6.1 below.

Table 6. 1 Locations Specific Works along the Aniisi – Kpatarigo Road

	Specific Works	**Location or Distance**
1	Clearing	0+000-8+700
2	Sectional gravelling	0+500-4+500
3	Construction of culverts	0+100-6+000

Other works will involve clearing, formation and excavation for gravel in borrow pit, spreading and laying and compacting.

Four types of new culverts will be constructed, eleven in number along the road. The sizes and numbers are as follows:

a) 6 No. 1200x900;
b) 2/ 1250x1800;
c) 2 No. 2/ 1200x900; and
d) 1 No. 1800x1800.

The list of types and numbers of equipment/machinery to be used include:

a) 1 No. Grader;
b) 1 No. Roller;
c) 1 No. Water dowser; and
d) 1 No. Concrete mixers.

The raw material and the estimated quantity will be:

a) gravel (sub-base): 6480m^3;
b) Sand: 1666m^3; and

c) Chippings: 19807m^3.

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated that a workforce of about 25 persons will be employed for the project. The project implementation will take about nine (9) months.

6.3 Potential Impacts, Mitigation and Monitoring Measures

There are no records of maintenance works on the Aniisi-Kpatarigo road available. The proposed Aniisi-Kpatarigo spot improvement is part of works to improve and maintain access in those communities in particular, and the Bawku Municipality in general.

The right of way (RoW) already exists. The effective width of the road remains at the standard 6.0m, though the road surface is in bad shape. The proposed works will mainly involve clearing of savannah grass within the RoW, sectional gravelling and filling and construction of culverts. The main beneficial and adverse environmental and social impacts likely to arise from the project, as well as the relevant mitigation measures are presented in this section.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety;
5. HIV/AIDS spread;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

6.3.1 Impacts on Water Resources, Mitigation and Monitoring

The road crosses only one seasonal stream. The construction of a culvert across this stream will entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the

water course and silt up the waterbed as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery near the stream could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size to direct and contain the stream to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs. Clearing of grass along the corridor from Aniisi-Kpatarigo will be restricted to the right of way (RoW), and road works will progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered.

Excavated materials will be retained away from the stream and covered, to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the stream. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the stream:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

6.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 8.7km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt mainly by some of the twenty five (25) workers. The effect of noise on communities, however, will be minimal, since the closest house to the corridor is about 100m away.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

6.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities, e.g. from the use of diesel powered equipments, such as the bulldozer, grader and excavator and can affect air quality. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since the closest house to the corridor is about 100m away.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along the road to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. When transporting construction materials, trucks will be covered with tarpaulin to prevent the flying of aggregates and sand. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

6.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

6.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with

the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

6.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

6.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

6.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 9 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

7.0 TEMPANE-WORIYANGA MINOR REHABILITATION PROJECT

7.1 Project Environment Information

The project road is located in the Garu-Tempane District, about 4.0km from Garu, the district capital. The road is 10km long with the following communities along the stretch: Tempane, Yibrago and Woriyanga.

There is a secondary school, market and houses located 30m, 50m and 60m respectively from the road corridor.

The vegetation type is grassland. The area is generally noted for agriculture (crop cultivation and livestock grazing). The area is drained by the Nayere stream. The topography is generally flat.

7.2 Project Description

The state of the road is poor. There are no records of previous rehabilitation works. The road has washouts and has suffered drainage structure failure.

The objective of the proposed rehabilitation works include improving access to farming areas, schools, markets and health centres as well as interconnection between communities.

The specific works intended to be carried out are mainly clearing, formation, culverts stone pitching, and sectional gravelling. The specific works (according to mileage (location) and/or distance) are provided in the Table 7.1 below.

Table 7. 1 Locations for Specific Works along Tempane – Yabrago – Warianga Road

	Specific Works	Location or Distance
1	Clearing	0+000-10+000
3	Construction of culverts	0+200-9+100
4	Filling and gravelling	0+150-9+300

Clearing involves weeding along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction. Formation works includes blading and drains. Filling will be done mainly in the approaches of culverts and also 18000 of gravel sub-base.

Four types of new culverts will be constructed, 14 in number along the road. The sizes and numbers are as follows:

a) 8 No. 1200x900;
b) 2 No. 1200x1200;
c) 3/ 3x3 box; and
d) 1 No. 3x2 box.

The list of types and numbers of equipment/machinery to be used include:

a) 1 Grader;
b) 1 Roller;
c) 1 Water dowser;
d) 1 Mixer;

The type of raw materials and the estimated quantities will include:

a) Sand: 3439 m^3;

b) Gravel (Sub-base): 10800 m^3; and
c) Chippings: 48298 m^3.

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated that a workforce of about 24 persons will be employed for the project. The project implementation will take about 9 months.

7.3 Potential Impacts, Mitigation and Monitoring Measures

There are no records of previous rehabilitation works on the Tempane-Woriyanga road available. The proposed Minor Rehabilitation Project is part of works to improve and maintain access in Tempane, Yibrago and Woriyanga communities in particular, and the Garu-Tempane District in general.

The right of way (RoW) already exists. The effective width of the road still remains the standard 6.0m. The proposed road works will mainly involve clearing of savannah grass within the RoW, construction of culverts (0+200-9+100) and filling and gravelling (0+150-9+300).

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc. With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration Impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety;
5. HIV/AIDS spread;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

7.3.1 Impacts on Water Resources, Mitigation and Monitoring

The area is drained by the Nayere stream. This is an important water body to communities and farmers whose farms are close to it as a main water supply source. It also serves sometimes for minor irrigation

purpose and for livestock watering. It sometimes dries up in the dry season, but it floods in the wet season. Due to the flat nature of the land, large areas become inundated when in floods.

Impact on this stream during the minor rehabilitation works will largely be siltation during clearing and subsequent erosion of top soil into the stream during the rainy season. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size to direct and contain the Nayere Stream, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs. Clearing of grass along the corridor from Tempane-Woriyanga will be restricted to the right of way (RoW), and road works will progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered.

Excavated materials will be retained away from the river and covered, to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the Nayere Stream:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

7.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 10.0km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive

noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt mainly by some of the twenty four (24) workers and persons in the secondary school which is 30m from the road. The effect of noise on communities, however, will be minimal, since the closest house to the corridor is about 50m away.

Impact of noise will be localised at the operational sites on workers. Noise protection devices such as ear muffs and plugs will be provided to all workers. The use of the protection device by workers will be mandatory at all work sites. The Site Engineer will be accountable for any instance of non-compliance.

Workers operating noisy and vibrating machines will not be allowed to work for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and available for inspection to ensure optimal noise generation. Works close to schools would be done after school hours. The static machines will be sited at least 100m away from homes to reduce their impacts. Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. Idle equipment will immediately be shut down.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

7.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Land clearing for the 10.0km stretch, haulage of material by trucks, sectional gravelling and compaction are all dust generating activities from the use of diesel powered equipments, such as the bulldozer, grader and excavator and can affect air quality. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since the closest house to the corridor is about 60m away.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control ramps will be erected along the road to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. When transporting construction materials, trucks will be covered with tarpaulin to prevent the flying of aggregates and sand. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;

- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

7.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

7.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would

enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

7.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and

- Toilets decommissioning on project completion.

7.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

7.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 9 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;

- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

8.0 SAPELIGA-GOZONGO ROAD SPOT IMPROVEMENT PROJECT

8.1 Project Environment Information

The project road is located in the Bawku West District, about 18km from Zebilla, the district capital. The road is 5.10km long and serves the Sapeliga, Attiton and Kaare communities.

There are houses at 50m from the road, a school at 60m from the road and farmlands at 20m along the road corridor.

The vegetation type is savannah grassland. Agriculture is the predominant economic activity - farming and livestock grazing. The area is drained by River Ziere and and two tributaries of the White Volta which cross the road at three sections. The topography is generally flat with some valleys at some sections.

8.2 Project Description

The current state of the road has drainage structure failure, soft spots and washouts giving it poor surface conditions. The width of the road remains 6.0m on the average.

The objective of the proposed spot improvement works includes improving the road to serve as a connector to farms and villages, and facilitating easy transportation of agricultural produce and people to market centres.

The specific works intended to be carried out are mainly culverts construction, stone pitching and sectional gravelling. The specific works (according to mileage (location) and/or distance) are provided in the Table 8.1 below.

Table 8. 1 Locations of Specific Works along Sapeliga – Gozongo Road

	Specific Works	Location or Distance
1	Clearing	0+000-2+400
2	Sectional gravelling	0+000-2+250
3	Construction of culverts	0+000-2+175

Other works will involve clearing, formation, spreading and laying and compacting.

Two types of new culverts will be constructed, 9 in number along the road. The sizes and numbers are as follows:

a) 1 No. 900x700; and
b) 8 No. 1200x900.

The list of types and numbers of equipment/machinery to be used include:

a) 1 No. Grader;
b) 1 No. Roller;
c) 1 No. Water dowser;
d) 1No. Bulldozer; and
e) 1 No. Concrete mixers.

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base): 6840 m^3;

b) Sand: 516 m^3; and
c) Chippings boulders: 6187 m^3.

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated that a workforce of about 24 persons will be employed for the project. The project implementation will take about nine (9) months.

8.3 Potential Impacts, Mitigation and Monitoring Measures

There are no records of maintenance works on the Sapeliga-Gozongo road available. The proposed Sapeliga-Gozongo spot improvement is part of works to improve and maintain access in those communities in particular, and the Bawku West District in general.

The right of way (RoW) already exists. The effective width of the road still remains the standard 6.0m. The proposed road works will mainly involve clearing of savannah grass within the RoW, construction of culverts and sectional gravelling.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety;
5. HIV/AIDS spread;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

8.3.1 Impacts on Water Resources, Mitigation and Monitoring

The area is drained by River Ziere and two tributaries of the White Volta which cross the road at three sections. These are important water bodies to communities and farmers, whose farms are close to it as a main water supply source. They also serve sometimes for minor irrigation purpose and for livestock

watering. They sometimes dry up in the dry season, but flood in the wet season. Due to the flat nature of the land, large areas become inundated when in floods.

The construction of a culvert across the water bodies will entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the water course and silt up the waterbed as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery near the water bodies could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size to direct and contain the River Ziere and two tributaries of the White Volta, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs. Clearing of grass along the corridor from Sapeliga-Gozongo will be restricted to the right of way (RoW), and road works will progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered.

Excavated materials will be retained away from the water bodies and covered, to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the water bodies. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the River Ziere:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

8.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 5.1km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive

noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt mainly by some of the twenty four (24) workers. The effect of noise on communities, however, will be minimal, since the closest house to the corridor is about 50m away.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

8.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Land clearing, haulage of materials by trucks, sectional gravelling and compaction are all dust generating activities, e.g. from the use of diesel powered equipments, such as the bulldozer, grader and excavator that can affect air quality. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since the closest house to the corridor is about 50m away.

Dust suppression will be carried out by sprinkling water at active sections where work is ongoing and along the haulage route twice daily. It is expected that strict enforcement of speed limits (40km/hr) of construction trucks and frequency of movements will reduce the generation of high quantities of dust considered as nuisance. A programme of servicing for all vehicles and equipment parts will be ensured. This programme will ensure that engines of all vehicles and equipment are maintained for optimum performance. This will reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;

- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

8.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and

The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

8.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

8.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two; organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

8.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

8.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 9 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;

- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

ROADS IN UPPER WEST REGION

9.0 CHALA-DUU SPOT IMPROVEMENT PROJECT

9.1 Project Environment Information

The road project is located in the Nadowli District, about 52.5km from Nadowli, the district capital. The road is 27.7km long with the following communities along the stretch: Chala, Kenkele and Duu. There are schools at Chala (CH 0+050) and Jimpensi (CH 2+500), market at Jimpensi (2+600) and health centre at Challa (0+100).

The vegetation type is savannah. The area is generally noted for agriculture (crop cultivation and grazing land for livestock). The Kulpawn Tributaries Forest Reserve is about 3500 metres from the road. The area is drained by 53 drainage channels and the road crossed by some streams and creeks, such as the Kulpawn tributaries. The topography is generally flat.

9.2 Project Description

The current state of the road is poor, though it benefited from some spot improvement works in 2008. It is earth surface with low lying sections and water crossing. Sections are rendered almost unmotorable in the rainy season. The width of the road is reduced to 4.0m on the average (instead of 6.0m).

The objective of the proposed spot improvement works includes improving access to farming areas (such as Veator, Jimpesi and Chala), schools (at Chala and Jimpesi), markets and health centres (at Jimpesi and Chala), Forest Reserve as well as interconnection between communities (Chala, Jimpesi, Duu and Veator).

The specific works intended to be carried out are mainly clearing, formation, construction of culverts, and filling and gravelling. These works (according to mileage (location) and/or distance) are provided in Table 9.1 below.

Table 9. 1 Locations of Specific Works on the Chala-Duu Road

	Specific Works	Location or Distance
1	Clearing	0+000 -22+700
2	Formation	0+000 -22+700
3	Construction of culverts	0+200, 0+410, 0+850, 1+500, 1+700, 1+715, 2+300, 2+400, 2+800, 3+000, 3+600, 4+100, 4+300, 4+600, 4+930, 5+200, 5+500, 5+800, 6+000, 6+300, 6+500, 7+020, 7+100, 7+400, 7+600, 8+020, 8+100, 8+210, 8+900, 9+400, 10+500, 11+100, 11+700, 11+800, 12+000, 12+200, 12+500, 12+550, 12+600, 12+700, 13+100, 13+900, 14+000, 14+150, 14+900, 15+000, 15+200, 15+300, 15+400, 15+700, 15+800, 15+900, 16+300, 16+730, 16+800, 17+200, 18+400, 19+700, 20+700, 21+150, 21+200, 21+500, 22+750, 23+020, 23+200, 23+800, 24+200, 24+400, 24+500, 24+770, 25+200, 25+500
4	Filling and gravelling	3+000 -4+000

Clearing involves weeding (of savannah vegetation) along the corridor to widen the width of the road to about 6.0m. It will also allow enough space for other works such as culvert construction formation works which include blading and drains. Five types of new culverts will be constructed, seventy seven in number along the road. The sizes and numbers are as follows:

a) 2 No. 900x700;

b) 41 No. 1200x900;
c) 25 No. 2/1200x900;
d) 1 No. 1800x1250; and
e) 8 No.2/1800x1250).

Filling will be done mainly in the approaches of culverts and also 1.0km of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

a) 1No. Bulldozer D7 or equivalent;
b) 1No. Motor Grader 140G or equivalent;
c) 1No. Loader ($1m^3$);
d) 2No. Tipper trucks ($6m^3$);
e) 1No. Water tanker (9000litres);
f) 1No. Vibratory or Static roller (10 tonnes);
g) 1No. Pick-up;
h) 1No. Concrete mixer ($0.5m^3$); and
i) 1No. Poker vibrator.

The type of raw materials and the estimated quantities will include:

a) Portland cement (10,418 bags);
b) Fine aggregates ($934m^3$);
c) Coarse aggregates ($1,869m^3$); and
d) Reinforcement rods (121 tonnes).

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty-four (24) for the project. The project implementation will take about 16 months.

9.3 Potential Impacts Mitigation and Monitoring Measures

Routine maintenance works were carried out on the Chala - Duu Road in 2008. The current proposed spot improvement project is part of regular on-going road works to improve and maintain access in the Chala and Duu communities in particular, and the Nadowli District in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 4.0m will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah within the RoW, construction of two (900x700), forty one (1200x900), twenty five (2/1200x900), one (1800x1250) and eight (2/1800x1250) 'U' shaped culverts along the drainage channels and at the Kulpawn River crossing.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.

With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety hazards;
5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts

9.3.1 Impacts on Water Resources, Mitigation and Monitoring

The road crosses the Kulpawn River. This is an important water body to communities and farmers whose farms are close to it and use it as their main water supply source.

The construction of a culvert across the Kulpawn will entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the water course and silt up the watercourse as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size, improved channelling and pitching to direct and contain the Kulpawn, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs.Clearing of grass along the road corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered with tarpaulin.

Excavated materials will be retained away from the river and covered to avoid possible losses into the watercourse. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;

- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the River Kulpawn:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

9.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 27.7km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt mainly by some of the workers.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

9.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will

also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along portions of the road that pass through communities to control dust generation. (These measures are best in communities!) Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

9.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and

The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

9.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

9.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance,

disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

9.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

9.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 16 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

10.0 KANDEO-GURUNGU SPOT IMPROVEMENT WORKS

10.1 Project Environment Information

The road project is located in the Wa West District, about 6.5km from Wechau, the district capital. The road is 20.35km long with the following communities along the stretch: Danlarayiri, Kwachiyiri, Kawu, Jagluu, Tagidoyiri, and Gurungu. There are schools (Local Authority Primary and JHS) at Kandeo and Gurungu, markets at Kandeo and Gurungu and health centre at Gurungu.

The vegetation type is savannah. The area is generally noted for agriculture (crop cultivation and grazing land for livestock). The area is drained by 49 drainage channels and the road crossed by 6 river channels (River Sako and its tributaries). The topography is generally flat.

10.2 Project Description

The road has deteriorated, though it benefited from some reshaping works in 2009. It is earth surface with low lying sections and water crossing. Sections are rendered almost unmotorable in the rainy season. The width of the road is reduced to 4.0m on the average (instead of 6.0m).

The objective of the proposed spot improvement works include improving access to farming areas, schools, markets and health centres as well as interconnection between communities. Communities such as Danlarayiri, Kwachiyiri, Kawu, Jagluu and Tagidoyiri which are along the road corridor access schools and markets as well as health centres at Kandeo and Gurungu.

The specific works intended to be carried out are mainly clearing, formation, construction of culverts, and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table 10.1 below.

Table 10. 1 Locations of Specific Works along Kandeo-Gurungu Road

	Specific Works	Location or Distance
1	Clearing	0+000-20+350
2	Formation	0+000-20+350
	Construction of culverts	0+000, 0+700, 0+800, 0+850, 1+000, 1+300, 1+500, 1+700, 2+100, 2+300, 3+000, 3+300, 3+400, 4+000, 4+300, 4+400, 4+800, 5+600, 6+025, 6+100, 8+100, 8+450, 8+500, 8+550, 9+250, 9+400, 10+000, 10+700, 11+000, 11+100, 11+200, 12+100, 12+2501, 12+900, 13+100, 13+600, 13+700, 13+800, 14+400, 14+700, 15+000, 15+700, 16+100, 17+000, 17+600, 17+900, 18+700, 19+200, 19+400, 19+700, 20+000, 23+300
4	Raising low lying sections	0+200-0+300, 0+900-1+100, 5+300-5+500

Clearing involves weeding (of savannah vegetation) along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction. Formation works include blading and drains. Two types of new culverts will be constructed, fifty four in number along the road. The sizes and numbers are as follows:

- 47 (1200x900); and
- 7 (900x700).

Filling will be done mainly in the approaches of culverts and also 1.0km of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

- 1 No. Bulldozer D7 or equivalent;
- 1 No. Motor Grader 140G or equivalent;
- 1 No. Loader (1m3);
- 2 No. Tipper trucks (6m3);
- 1 No. Water tanker (9000litres);
- 1 No. Vibratory or Static roller (10 tonnes);
- 1 No. Pick-up;
- 1 No. Concrete mixer (0.5m3); and
- 1 No. Poker vibrator.

The type of raw materials and the estimated quantities will include:

- Portland cement (5212 bags);
- Fine aggregates (390m^3);
- Coarse aggregates (780m^3); and
- Reinforcement rods (22 tonnes).

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty-four (24) for the project. The project implementation will take about 16 months.

10.3 Potential Impacts, Mitigation and Monitoring Measures

Routine maintenance works were carried out on the Kandeo-Gurungu road in 2009. The current proposed spot improvement project is part of regular on-going road works to improve and maintain access in the Kandeo, Danlarayiri, Kwachiyiri, Kawu, Jagluu, Tagidoyiri, and Gurungu communities in particular, and the Wa West District in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 4.0m will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah within the RoW, construction of seven (900x700) and forty seven (1200x900), 'U' shaped culverts along the drainage channels and at the Sako River and its tributaries crossings.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**)**. Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety hazards;
5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

10.3.1 Impacts on Water Resources, Mitigation and Monitoring

The road crosses the Sako River and its tributaries. These are important water bodies to communities and farmers whose farms are close to them and use them as their main water supply sources.

The construction of a culvert across the Sako and its tributaries will entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the water course and silt up the waterbed as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size, improved channelling and pitching to direct and contain the Sako and its tributaries, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water bodies. Drains will direct storm-water and run-offs.Clearing of grass along the road corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered with tarpaulin.

Excavated materials will be retained away from the river and covered to avoid possible losses into the watercourse. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the Sako River:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);

- Oil and grease waste from equipment servicing and vehicle washing; and
- Construction of drainage channels and culverts.

10.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 20.35km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt mainly by some of the workers and the nearby communities.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

10.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along portions of the road that pass through communities to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

10.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;

- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

10.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

10.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will

be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

10.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

10.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 16 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

11.0 KPARI-NAWIE ROAD MINOR REHABILITATION WORKS

11.1 Project Environment Information

The road project is located in the Lambussie District, about 15km from Naawie, the district capital. The road is 7.70km long with the following communities along the stretch: Kpari, Naawie, Kefiace. There are schools at Kpari, Naawie and Kefiace, markets at Piina and health centre and SHS at Piina.

The vegetation type is savannah. The area is generally noted for agriculture (crop cultivation and grazing land for livestock). The area is drained by 14 drainage channels and the road crossed by some 3 river channels (Chunuoba tributaries and River Kamba and its tributaries). The topography is generally flat.

11.2 Project Description

The current state of the road is bad, even though it benefited from some reshaping works in 2009. It is earth surface with low lying sections and water crossing. Sections are rendered almost unmotorable in the rainy season. The width of the road is reduced to 4.0m on the average (instead of 6.0m).

The objective of the proposed spot improvement works include improving access to farming areas at Kpari, Naawie and Kefiace, schools (Kindergarten and Primary), markets and health centres as well as interconnection between communities (Kpari, Naawie and Kefiace access major market at Piina).

The specific works intended to be carried out are mainly clearing, formation, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table 11.1 below.

Table 11. 1 Locations of Specific Works along Kpari-Nawie Road

	Specific Works	Location or Distance
1	Clearing	0+000 -7+700
2	Formation	0+000 -7+700
3	Construction of culverts	0+150, 0+300, 0+325, 0+900, 2+000, 3+200, 4+500, 5+200, 5+250, 5+300, 6+000, 6+100, 6+600
4	Filling and gravelling	2+000 -3+000

Clearing involves weeding or savannah vegetation removal along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction, formation works which include blading and drains. Two types of new culverts will be constructed, sixteen in number along the road. The sizes and numbers are as follows:

- 2 No.(900x700); and
- 14 No. (1200x900).

Filling will be done mainly in the approaches of culverts and also 1.0km of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

- 1No. Bulldozer D7 or equivalent;
- 1No. Motor Grader 140G or equivalent;
- 1No. Loader (1m3);
- 2No. Tipper trucks (6m3);
- 1No. Water tanker (9000litres);

- 1No. Vibratory or Static roller (10 tonnes);
- 1No. Pick-up;
- 1No. Concrete mixer (0.5m3); and
- 1No. Poker vibrator.

The type of raw materials and the estimated quantities will include:

- Portland cement (1305 bags);
- Fine aggregates ($95m^3$);
- Coarse aggregates ($190m^3$); and
- Reinforcement rods (9 tonnes).

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty-four (24) for the project. The project implementation will take about 16 months.

11.3 Potential Impacts, Mitigation and Monitoring Measures

Routine maintenance works were carried out on the Kwametente-Jaro-Nsuhunu road in 2009. The current proposed minor rehabilitation project is part of regular on-going road works to improve and maintain access in the Kwametente, Jaro and Nsuhunu communities in particular, and the Lambussie District in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 4.0m will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah within the RoW, construction of two (900x700) and fourteen (1200x900), 'U' shaped culverts along the drainage channels and at the Kamba and Chunuoba River crossings.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade**.).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;

4. Occupational health and safety hazards;
5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

11.3.1 Impacts on Water Resources, Mitigation and Monitoring

The road crosses the Kamba and Chunuoba Rivers. These are important water bodies to communities and farmers whose farms are close to them and use them as their main water supply sources.

The construction of culverts across the Kamba and Chunuoba Riverswill entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the water course and silt up the waterbed as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size, improved channelling and pitching to direct and contain the Kamba and Chunuoba Rivers, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water bodies. Drains will direct storm-water and run-offs.Clearing of grass along the road corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered with tarpaulin.

Excavated materials will be retained away from the rivers and covered to avoid possible losses into the watercourse. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the rivers. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the Kamba and Chunuoba Rivers:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

11.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 7.70km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt mainly by some of the workers members of Kpari, Naawie and other communities.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

11.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along portions of the road that pass through communities to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

11.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and

The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

11.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

11.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

11.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

11.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 16 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or

may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

12.0 NAABUGUBELLE – NWANDUONO SPOT IMPROVEMENT WORKS

12.1 Project Environment Information

The road project is located in the Sissala East District, about 28km from Naabugubelle, the district capital. The road is 11.0km long with Naabugubelle and Nwanduono communities along the stretch. There are schools at Naabugubelle (0+120) and Nwanduono (10+500) as well as clinic and markets at Naabugubelle and Nwanduono.

The vegetation type is savannah. The area is generally noted for agriculture (crop cultivation and grazing land for livestock). The area is drained by 16 drainage channels and the road crossed by some 5 streams and creeks namely Erie, Fuobie, Bubua Chary and Nyoayiri. The topography is generally flat.

12.2 Project Description

The current state of the road is poor and has not benefited from any recent rehabilitation works. It is earth surface with low lying sections and water crossing. Sections are rendered almost unmotorable in the rainy season. The width of the road is reduced to 4.0m on the average (instead of 6.0m).

The objective of the proposed spot improvement works include improving access to farming areas, schools, markets and health centres as well as interconnection between communities (Tumu, Naabugubelle and Nwanduono).

The specific works intended to be carried out are mainly clearing, formation, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table 12.1 below.

Table 12. 1 Locations of Specific Works along Naabugubelle – Nwanduono Road

	Specific Works	Location or Distance
1	Clearing	0+000 - 11+000
2	Formation	0+000 - 11+000
3	Construction of culverts	0+100, 0+300, 0+500, 1+400, 2+400, 2+850, 3+000, 3+300, 4+500, 5,+000, 5+400, 6+350, 6+700, 7+400, 7+850, 8+500, 8+900, 9+500, 10+150, 10+500, 10+850
4	Filling and gravelling	2+500 -3+500, 5+000-6+000, 8+700-9+700

Clearing involves weeding (of savannah vegetation) along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction and formation works which include blading and drains. Three types of new culverts will be constructed, twenty one in number along the road. The sizes and numbers are as follows:

- 19 No. (1200x900);
- 1 No. (2/2x2m); and
- 1 No. (2/3 x2m).

Filling will be done mainly in the approaches of culverts and also 1.0km of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

- 1 No. Bulldozer D7 or equivalent;
- 1 No. Motor Grader 140G or equivalent;
- 1 No. Loader ($1m^3$);

- 2 No. Tipper trucks ($6m^3$);
- 1 No. Water tanker (9000litres);
- 1 No. Vibratory or static roller (10 tonnes);
- 1 No. Pick-up;
- 1 No. Concrete mixer ($0.5m^3$); and
- 1 No. Poker vibrator.

The type of raw materials and the estimated quantities will include:

- Portland cement (3055 bags);
- Fine aggregates ($205m^3$);
- Coarse aggregates ($408m^3$); and
- Reinforcement rods (58.5 tonnes).

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty-four (24) for the project. The project implementation will take about 16 months.

12.3 Potential Impacts, Mitigation and Monitoring Measures

No rehabilitation works has been done on the Naabugubelle – Nwanduono road since it was created. The current proposed Spot Improvement project is the beginning of regular rehabilitation works to be undertaken on the road. This will improve and maintain access in the Naabugubelle and Nwanduono communities in particular, and the Sissala East District in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 4.0m will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah within the RoW, construction of one (2/2x2m), one (2/3 x2m) and nineteen (1200x900), 'U' shaped culverts along the drainage channels and at the Erie, Fuobie, Bubua Chary and Nyoayiri River crossings.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety hazards;
5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

12.3.1 Impacts on Water Resources, Mitigation and Monitoring

The road crosses the Erie, Fuobie, Bubua Chary and Nyoayiri Rivers. These are important water bodies to communities and farmers whose farms are close to them and use them as their main water supply sources.

The construction of culverts across the Erie, Fuobie, Bubua Chary and Nyoayiri Riverswill entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the water course and silt up the waterbed as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size, improved channelling and pitching to direct and contain the Erie, Fuobie, Bubua Chary and Nyoayiri Rivers, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water bodies. Drains will direct storm-water and run-offs.Clearing of grass along the road corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered with tarpaulin.

Excavated materials will be retained away from the rivers and covered to avoid possible losses into the watercourse. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the rivers. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the water bodies:

- Sediment-laden run-off from cleared areas of road;
- Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
- Oil and grease waste from equipment servicing and vehicle washing; and
- Construction of drainage channels and culverts.

12.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 11.00km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt mainly by some of the workers and the schools at Naabugubelle (0+120) and Nwanduono (10+500) as well as clinic and markets at Naabugubelle and Nwanduono.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

12.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also

result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along portions of the road that pass through communities to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

12.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;

- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and

The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

12.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

12.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest

district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

12.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

12.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 16 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

13.0 PIENG – BUJANG SPOT IMPROVEMENT WORKS

13.1 Project Environment Information

The road project is located in the Sissala East District, about 18km from Pien, the district capital. The road is 8.60km long with the following communities along the stretch: Pieng, Nanchalla and Bujang. There are schools at Pieng, Nanchalla and Bujang and health centres at Pieng (CHPS compound) and Bujang.

The vegetation type is savannah. The area is generally noted for agriculture (crop cultivation and grazing land for livestock). The area is drained by 14 drainage channels and the road crossed by a river Kajia. The topography is generally flat.

13.2 Project Description

The current state of the road is poor, though it benefited from some reshaping works in 2009. It is earth surface with low lying sections and water crossings. Sections are rendered almost unmotorable in the rainy season. The width of the road is reduced to 4.5m on the average (instead of 6.0m).

The objective of the proposed spot improvement works include improving access to farming areas, schools, markets and health centres as well as interconnection between communities (access to markets at Naabugubelle and Nwanduono).

The specific works intended to be carried out are mainly clearing, formation, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table 13.1 below.

Table 13. 1 Locations of Specific Works along Pieng – Bujang Road

	Specific Works	Location or Distance
1	Clearing	0+000 - 8+600
2	Formation	0+000 - 8+600
3	Construction of culverts	0+100, 0+530, 0+800, 1+000, 2+400, 2+700, 2+800, 3+100, 4+500, 4+600, 4+650, 4+800, 5+700, 6+200, 7+600
4	Filling and gravelling	3+000 -4+000

Clearing involves weeding (of savannah vegetation) along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction, formation works which include blading and drains. Two types of new culverts will be constructed, fifteen in number along the road. The sizes and numbers are as follows:

- 14 No. (1200x900); and
- 1 No. (2/1800x1250).

Filling will be done mainly in the approaches of culverts and also 1.0km of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

- 1 No. Bulldozer D7 or equivalent;
- 1 No. Motor Grader 140G or equivalent;
- 1 No. Loader ($1m^3$);
- 2 No. Tipper trucks ($6m^3$);
- 1 No. Water tanker (9000litres);

- 1 No. Vibratory or Static roller (10 tonnes);
- 1 No. Pick-up;
- 1 No. Concrete mixer (0.5m3); and
- 1 No. Poker vibrator.

The type of raw materials and the estimated quantities will include:

- Portland cement (2695 bags);
- Fine aggregates (188m^3);
- Coarse aggregates (377m^3); and
- Reinforcement rods (13.5 tonnes).

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty-four (24) for the project. The project implementation will take about 10 months.

13.3 Potential Impacts, Mitigation and Monitoring Measures

Routine maintenance works were carried out on the Pieng – Bujang road in 2009. The current proposed spot improvement project is part of regular on-going road works to improve and maintain access in the Pieng and Bujang communities in particular, and the Sissala East District in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 4.5m will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah within the RoW, construction of one (2/1800x1250) and fourteen (1200x900) 'U' shaped culverts along the drainage channels and at the Kajia River crossing.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety hazards;

5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

13.3.1 Impacts on Water Resources, Mitigation and Monitoring

The road crosses the Kajia River. This is an important water body to communities and farmers whose farms are close to it and use it as their main water supply source.

The construction of culverts across the Kajia Riverwill entails clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the watercourse and silt up the waterbed as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the watercourse leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size, improved channelling and pitching to direct and contain the Kajia River, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs.Clearing of grass along the road corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered with tarpaulin.

Excavated materials will be retained away from the river and covered to avoid possible losses into the watercourse. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the rivers. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Water resource monitoring will be carried out by the site engineer to make sure that appropriate and acceptable methods are used when diverting the watercourse. Also water sourcing for the construction purposes will be monitored to ensure that water resources are not polluted. A monthly monitoring report will be submitted to the district office of the feeder roads to ensure compliance.

13.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 8.60km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The

effects will be felt mainly by some of the workers and schools at Pieng, Nanchalla and Bujang and health centres at Pieng (CHPS compound) and Bujang.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

13.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along portions of the road that pass through communities to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;

- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

13.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and

The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

13.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

13.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

13.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

13.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 10 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;

- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

14.0 TINNIABELLE – SAWBELLE MINOR REHABILITATION WORKS

14.1 Project Environment Information

The road project is located in the Wa East District, about 21km from Tinniabelle, the district capital. The road is 4.40km long with Tinniabelle and Sawbelle communities along the stretch. There are schools at Tinniabelle (0+0100) and Sawbelle (4+450).

The vegetation type is savannah. The area is generally noted for agriculture (crop cultivation and grazing land for livestock). The area is drained by 14 drainage channels and the road crossed by some 4 streams and creeks such as river Begelimbe. The topography is generally flat.

14.2 Project Description

The current state of the road is poor. The road is not on record to have benefited from any rehabilitation works. It is earth surface with low lying sections and water crossings. Sections are rendered almost unmotorable in the rainy season. The width of the road is reduced to 3.5m on the average (instead of 6.0m).

The objectives of the proposed rehabilitation works include improving access to farming areas, schools, at Tinniabelle and Sawbelle as well as interconnection between these communities.
The specific works intended to be carried out are mainly clearing, formation, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table 14.1 below.

Table 14. 1 Locations of Specific Works along Tinniabelle – Sawbelle Road

	Specific Works	Location or Distance
1	Clearing	0+000 - 4+400
2	Formation	0+000 - 4+400
3	Construction of culverts	0+400, 0+500, 1+050, 1+100, 1+150, 1+550, 1+600, 1+650, 2+000, 2+050, 2+100, 2+600, 2+950, 3+250, 3+550, 3+650, 4+200
4	Filling and gravelling	0+000 - 4+400

Clearing involves weeding (of savannah vegetation) along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction, formation works which include blading and drains. Four types of new culverts will be constructed, eighteen in number along the road. The sizes and numbers are as follows:

- 12 No. (1200x900);
- 4 No. (2/1200x900);
- 1 No. (2/1800x1250); and
- 1 No. (2/2x2).

Filling will be done mainly in the approaches of culverts and also 1.0km of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

- 1 No. Bulldozer D7 or equivalent;
- 1 No. Motor Grader 140G or equivalent;
- 1 No. Loader (1m3);
- 2 No. Tipper trucks (6m3);
- 1 No. Water tanker (9000litres);

- 1 No. Vibratory or Static roller (10 tonnes);
- 1 No. Pick-up;
- 1 No. Concrete mixer (0.5m3); and
- 1 No. Poker vibrator

The type of raw materials and the estimated quantities will include:

- Portland cement (2746bags);
- Fine aggregates (180m^3);
- Coarse aggregates (361m^3); and
- Reinforcement rods (41 tonnes).

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty-four (24) for the project. The project implementation will take about 6 months.

14.3 Potential Impacts, Mitigation and Monitoring Measures

No rehabilitation works has been done on the Tinniabelle – Sawbelleroad since it was created. The current proposed minor rehabilitation project is the beginning of regular rehabilitation works to be undertaken on the road. This will improve and maintain access in the Tinniabelle and Sawbelle communities in particular, and the Wa East District in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 3.5m will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah within the RoW, construction of one (2/1800x1250), four (2/1200x900), one (2/2x2) and twelve (1200x900) 'U' shaped culverts along the drainage channels and at the Begelimbe River crossing.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;

3. Dust generation and impact on air quality;
4. Occupational health and safety hazards;
5. Spread of HIV/AIDS and STIs;
6. Potential waste generation;
7. Road diversion; and
8. Temporary site office impacts.

14.3.1 Impacts on Water Resources, Mitigation and Monitoring

The road crosses the Begelimbe River. This is an important water body to communities and farmers whose farms are close to it and use it as their main water supply source.

The construction of culverts across the Begelimbe River will entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the watercourse and silt up the waterbed as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the watercourse leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size, improved channelling and pitching to direct and contain the Begelimbe River, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs.Clearing of grass along the road corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered with tarpaulin.

Excavated materials will be retained away from the river and covered to avoid possible losses into the watercourse. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling will be carried out at suitable and confined designated places, away from the rivers. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the River Begelimber:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

14.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 4.40km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt mainly by some of the workers and the schools.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

14.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along portions of the road that pass through communities to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

14.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and

The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

14.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

14.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

14.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

14.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 6 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or

may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

15.0 JEFFISI-TIMMIESPOT IMPROVEMENT WORKS

15.1 Project Environment Information

The road project is located in the Sissala West District, about 28km from Gwollu, the district capital. The road is 6.50km long with Jeffisi and Timmie communities along the stretch. There are schools at Jeffisi, market at Jeffisi and health centre at Jeffisi.

The vegetation type is savannah. The area is generally noted for agriculture (crop cultivation and grazing land for livestock). The Gbelle Game Reserve is about 2000 metres from the road. The area is drained by14 drainage channels and the road crossed by some 9 river channels including Fouwie, Chikenvivle Ambrerifuo, Chebour, Yelewiefour and Banorfour. The topography is generally flat.

15.2 Project Description

The current state of the road is poor with an earth surface, low lying sections and water crossings. The road width is reduced to 3.0m on the average instead of 6.0m.

The objective of the proposed spot improvement works includes improving access to farming areas, schools, markets, health centres, Gbelle Game Reserve as well as interconnection between communities (access to health centre, school and market from Timmie to Jeffisi).

The specific works intended to be carried out are mainly clearing, formation, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table 15.1 below.

Table 15. 1 Locations of Specific Works along Jeffisi-Timmie Road

	Specific Works	Location or Distance
1	Clearing	(0+000 - 6+500)
2	Formation	(0+000 - 6+500)
3	Construction of culverts	(0+000, 0+475, 0+525, 1+000, 1+200, 1+400, 2+200, 2+300, 2+500, 2+900, 3+000, 3+600, 3+700, 3+800, 3+900, 4+100, 4+300, 4+500, 4+800, 5+300, 5+800, 5+900, 6+000
4	Filling and gravelling	1+000 -3+400, 5+500-6+100

Clearing involves weeding (of savannah vegetation) along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction. Formation works includes blading and drains. Five types of new culverts will be constructed, seventy seven in number along the road. The sizes and numbers are as follows:

- 1 No. 900x700;
- 13 No. 1200x900;
- 4 No. 2/1200x900;
- 2 No. 1800 x1800;
- 1 No. 2/1800 x1800;
- 1 No. 2/2x2m; and
- 1 No. 2/3x2m.

Filling will be done mainly in the approaches of culverts and also 3.0km of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

- 1No. Bulldozer D7 or equivalent;

- 1No. Motor Grader 140G or equivalent;
- 1No. Loader ($1m^3$);
- 2No. Tipper trucks ($6m^3$);
- 1No. Water tanker (9000litres);
- 1No. Vibratory or Static roller (10 tonnes);
- 1No. Pick-up;
- 1No. Concrete mixer (0.5m3); and
- 1No. Poker vibrator.

The type of raw materials and the estimated quantities will include:

- Portland cement (4331 bags);
- Fine aggregates ($314m^3$);
- Coarse aggregates ($626m^3$); and
- Reinforcement rods (62.5 tonnes).

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty-four (24) for the project. The project implementation will take about 16 months.

15.3 Potential Impacts, Mitigation and Monitoring Measures

No rehabilitation works has been done on the Jeffisi-Timmieroad since it was created. The current proposed Spot Improvement project is the beginning of regular rehabilitation works to be undertaken on the road. This will improve and maintain access in the Jeffisi-Timmie communities in particular, and the Sissala West District in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 3.0m will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah within the RoW, construction of one (2/1800x1800), four (2/1200x900), one (2/2x2m), one (2/3x2m), two (1800x1800), one (900x700) and thirteen (1200x900) 'U' shaped culverts along the drainage channels and at the Fouwie, Chikenvivle Ambrerifuo, Chebour, Yelewiefour and Banorfour River crossings.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety hazards;
5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

15.3.1 Impacts on Water Resources, Mitigation and Monitoring

The road crosses the Fouwie, Chikenvivle, Ambrerifuo, Chebour, Yelewiefour and Banorfour Rivers. These are important water bodies to communities and farmers whose farms are close to them and use them as their main water supply sources.

The construction of culverts across the Fouwie, Chikenvivle Ambrerifuo, Chebour, Yelewiefour and Banorfour Rivers will entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the watercourse and silt up the waterbed as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the watercourse leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size, improved channelling and pitching to direct and contain the Fouwie, Chikenvivle Ambrerifuo, Chebour, Yelewiefour and Banorfour Rivers, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water bodies. Drains will direct storm-water and run-offs.Clearing of grass along the road corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered with tarpaulin.

Excavated materials will be retained away from the river and covered to avoid possible losses into the watercourse. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the rivers. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and

- There will be weekly monitoring on the following relevant sources of impacts on the water bodies:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

15.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 6.50km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt mainly by some of the workers and the Jeffisi and Timmie communities.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

15.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also

result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along portions of the road that pass through communities to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

15.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;

- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and

The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

15.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

15.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest

district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

15.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

15.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 16 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

ROADS IN NORTHERN REGION

16.0 BUIPE-KOTITO NO. 3 SPOT IMPROVEMENT PROJECT

16.1 Project Environment Information

The project road is located in the Central Gonja District, beginning from Buipe, the district capital to Kotito No. 3. The road is 40.08km long and 5.0m wide and has communities like Buipe, Old Buipe Wampe and Kotito No.3 along the stretch.

The following are located along the road: Girls' Vocational School, Savannah Cement Factory (under construction) and Old Buipe Primary School located at (1+600), (3+700) and (12+800) respectively.

The vegetation type is savannah. The area is generally noted for agriculture (crop cultivation and grazing land for livestock). The topography is generally flat.

16.2 Project Description

The road surface is in a poor condition with depressions, gullies, hard pan sections, soft spots, corrugations, etc. It benefited from some spot improvement works 6 years ago. It is earth surfaced with poor drainage structures and a number of water crossing points. The road is almost unmotorable in the rainy season.

The objective of the proposed spot improvement works is to facilitate the transportation of agricultural produce and access to market and health centres, as well as interconnection between communities like Lelekura, Old Buipe and Wampe.

The specific works intended to be carried out are mainly clearing, formation, construction of drainage structures and laying of sub-base. The specific works (according to mileage (location) and/or distance) are provided in Table 16.1 below.

Table 16. 1 Locations of Specific Works along Buipe-Kotito No. 3 Road

	Specific Works	Location or Distance
1	Clearing	0+000-40+080
2	Formation	0+000-40+080
3	Construction of drainage structures	10No.
4	Laying of sub-base	4002m

Clearing involves weeding or removal of savannah vegetation along the corridor with a dozer. This is expected to widen the width of the road and also allow enough space for other works such as construction of drains. Formation works include blading and compaction of road surface, while laying of sub-base will involve 4km of sectional gravelling.

A total of three types of drainage structures, ten (10) in all, including u-culverts will be constructed along the road. The sizes and numbers are as follows:

a) 3 No. 700 x 900,
b) 6No. 900x1200,
c) 1No. 2/1800x1800

The list of types and numbers of equipment/machinery to be used include:

a) 1No. Bulldozer D7 or equivalent,
b) 1No. Motor Grader 140G or equivalent,
c) 1No. Pay Loader ($1m^3$);

d) 1No. Low Loader
e) 1No. Excavator
f) 4No. Tipper trucks (6m^3);
g) 1No. Water tanker (9000 litres);
h) 1No. Vibratory or Static roller (10 tonnes);
i) 1No. Pick-up;
j) 1No. Concrete mixer (0.5m^3); and
k) 1No. Poker vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - 3602 m^3;
b) Aggregates - 284 m^3
c) Portland Cement- 2400 bags; and
d) Filled material - 7360 m^3.

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of fifteen (15) for the project. The project implementation will take about 12 months.

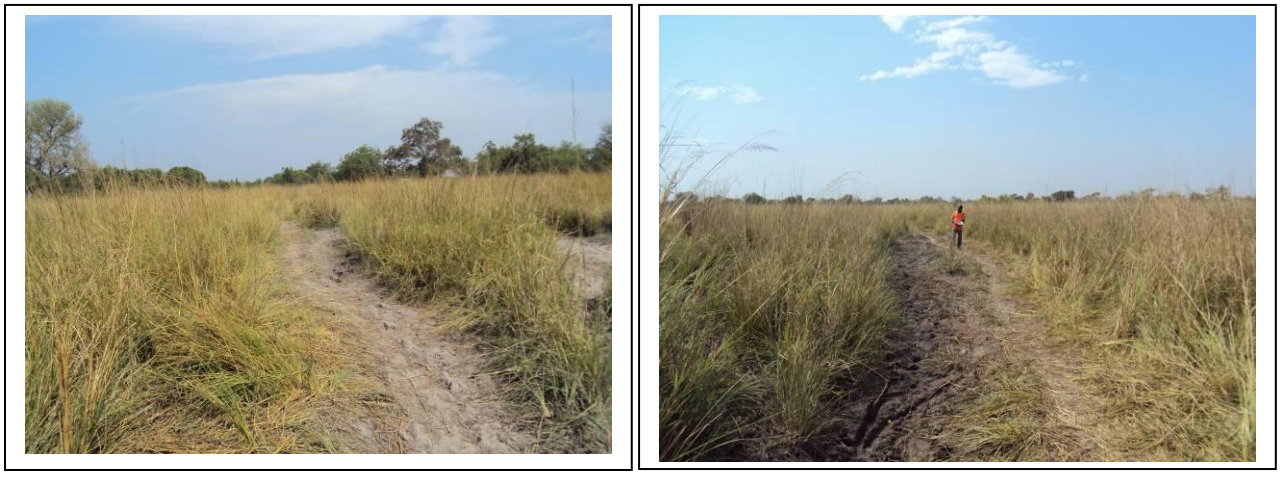

Figure 16. 1 Sections of the Road Taken Up by Weeds

16.3 Potential Impacts, Mitigation and Monitoring Measures

The Buipe-Kototo No. 3 Road underwent spot improvement works about six years ago. The current proposed spot improvement project is part of regular on-going road works to improve and maintain access in the Buipe, Old Buipe, Wampe and Kotito No.3 communities, and the Central Gonja District in general.

Although the right of way (RoW) already exists, the effective width of the road has to a large extent reduced to about 5.0m in sections, which will be restored to its original 6.0m width. The proposed road

works will mainly involve clearing of savannah grass within the RoW, construction of drainage structures and laying of sub-base.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc. With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on air quality;
2. Noise and vibration impacts;
3. Impacts on water resources;
4. Health and safety risks;
5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

16.3.1 Potential Impacts on Air Quality, Mitigation and Monitoring

Clearing of savannah vegetation along the road (0+000-40+080) with a bulldozer, blading with a motor grader to ensure evenness on the road, tipping and offloading of construction materials such as filling material (7360m^3), aggregates (284m^3), Portland Cement (2400 bags) and gravel for sub-base (3602m^3) will generate dust in the immediate environment. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Workers exposed to dust will be provided with nose masks. The drivers would be required to undertake servicing and maintenance of their respective so that the exhaust emissions are brought under control. Water dousing will be undertaken twice daily (morning and afternoon) in the dry season in order to minimize dust concentration in the air. All heaped sand and flyable materials will be covered.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

16.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Site clearance, construction of a SO and compacting of the road would require the use of among others, bulldozer, concrete mixer, motor grader and vibratory roller. These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. These processes may have a direct negative impact on the operators and other workers due to noise generation and vibration. Exposure to excessive noise may result in auditory fatigue and reduced concentration. Noise directly attributable to site clearing and construction activities are not likely to result in noise levels in residential areas, since they are distant from the road. However, it is anticipated that persons closest to the working area, machine operators and construction crew will be most affected the communities will also be recipients.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

16.3.3 Potential Impacts on Water Resources, Mitigation and Monitoring

The road corridor is devoid of any water resource. It is therefore, unlikely that the spot improvement works will affect water quality. However, the contractor will ensure that activities of the project are carried out in an environmentally sound manner.

It will be ensured that vehicle washing, servicing, fuelling and refuelling are carried out at designated places to avoid oil spills. Drains will be designed to direct stormwater and other run-offs away from the borehole.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the water bodies:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);

- Oil and grease waste from equipment servicing and vehicle washing; and
- Construction of drainage channels and culverts.

16.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and

The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

16.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

16.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

16.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

16.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 12 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;

- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

17.0 SAWLA-DAGBEWU SPOT IMPROVEMENT PROJECT

17.1 Project Environment Information

The project road is located in the Sawla-Tuna-Kalba District, beginning from Sawla, the district capital to Dagbewu. The road is 25.8km long and 3.0m wide with the following communities along the stretch: Sawla, Digize, Gunyiri, Nakpala, Deriyiri and Dagbewu.

There is a basic school at Nakpala located at about 11+600 on the road and some farms at ch 3+200 - 4+500 (RHS), 7+800-8+500 (L/R), 20+100 – 20+800 (L/R) and 22+400-24+800 (L/R). These farms are roughly 15m off the road. At 0+370 is a Dam to the LHS which is about 50m off.

The vegetation type is savannah. The area is generally noted for agriculture (crop cultivation and grazing land for livestock). The area is drained by two drainage channels and the road crossed by the River Gbongbong. The topography is generally undulating.

17.2 Project Description

The state of the road is poor and the last time it was reshaped was 6 years ago. The road is partially engineered from 0+000 to 17+200 and un-engineered from 17+000 to 25+000, with poor road surface conditions (depressions, soft spots, ruts, etc), inadequate drainage structures, hard pan sections and rock outcrop. It has one river crossing point at Ch 22+170 (River Gbonggbong).

The objective of the proposed spot improvement works includes ensuring all-year-round accessibility at optimum cost, improving access to farming areas, schools, markets and health centres, as well as interconnection between communities like Digize, Gunyiri, Nakpala, and Deriyiri.

The specific works intended to be carried out are mainly clearing, formation, construction of drainage channels, and lying of sub-base. The specific works (according to mileage (location) and/or distance) are provided in Table 17.1 below.

Table 17. 1 Locations of Specific Works along Sawla-Dagbewu Road

	Specific Works	Location or Distance
1	Clearing	1+000-12+000, 12+000-25+000
2	Formation	18,360m
3	Construction of drainage structure	18No.
4	Laying of sub-base	2720 m

Clearing involves weeding along the corridor with a dozer. This is expected to widen the width of the road and also allow enough space for other works such as construction of drainage structures. Formation works to be carried out will include blading and compaction of road surface, while laying of sub-base will involve 3.25km of sectional gravelling.

A total of five different types of drainage structures, eighteen (18) in number, including u-culverts will be constructed along the road. The sizes and numbers are as follows:

a) 10 No. 700 x 900,
b) 4No. 900x1200,
c) 1No. 1200x1200
d) 2No. 1250x1800
e) 1No.2/ 1250x1800

The list of types and numbers of equipment/machinery to be used include:

a) 1No. Bulldozer D7 or equivalent,
b) 2No. Motor Grader 140G or equivalent,
c) 1No. Pay Loader ($1m^3$);
d) 1No. Low Loader
e) 1No. Excavator
f) 4No. Tipper trucks ($6m^3$);
g) 1No. Water tanker (9000litres);
h) 1No. Vibratory or Static roller (10 tonnes);
i) 1No. Pick-up;
j) 1No. Concrete mixer ($0.5m^3$); and
k) 1No. Poker vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - $2448m^3$; and
b) Aggregates - $469m^3$
c) Portland cement - 1970-bags
d) Filling Material -14008 m^3

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated that a workforce of fifteen (15) persons shall be employed for the project. The project implementation will take about12 months.

17.3 Potential Impacts, Mitigation and Monitoring Measures

The Sawla-Dagbewu Road experienced spot improvement works about six years ago. The current proposed spot improvement project is part of regular on-going road works to improve and maintain access in the Sawla, Digize, Gunyiri, Nakpala, Deriyiri and Dagbewu communities, and the Sawla-Tuna-Kalba District in general.

The right of way (RoW) already exists, but the effective width of the road has to a large extent reduced to about 3.0m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah grass within the RoW, construction of drainage structures and laying of sub-base.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and

also enhance trade**.** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on air quality;
2. Noise and vibration impacts;
3. Impacts on water quality;
4. Public occupational health risk;
5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

17.3.1 Potential Impacts on Air Quality, Mitigation and Monitoring

Silica in dust from the earth agitated by a bulldozer during land clearing and motor grader on the road may impact on air quality. Dust resulting from tipping and offloading of construction materials such as gravel for sub-base (2448m^3), aggregates (469m^3), Portland cement (1970 bags) and filling material (14008m^3) will also have some impacts on air quality. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site. Some of the workers and the school at Nakpala as well as some of the communities may suffer from dust impacts.

Drivers would be required to undertake preventive maintenance, and also maintain their respective vehicles by their proper servicing (tuning of engine) so as to minimise exhaust emissions. Workers exposed to dust will be provided with nose masks. Water dousing will be undertaken twice daily (morning and afternoon) in the dry season in order to minimize dust concentration in the air.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

17.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The use of equipments like a bulldozer, concrete mixer, motor grader and vibratory roller for activities such as site clearing, construction of a SO and compacting of the road would result in noise generation and vibration. These processes may have a direct negative impact on the operators and other workers. These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. Workers exposure to excessive noise may result in auditory fatigue and reduced concentration. Noise directly attributable to

site clearing and construction activities are not likely to result in noise levels in residential areas, since they are distant from the road.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

17.3.3 Potential Impacts on Water Resources, Mitigation and Monitoring

The River Gbongbong that crosses the road is important water body to communities and farmers who depend on it as their main water supply source. It also serves sometimes for minor irrigation purpose and for livestock watering. Since the project will last for about twelve months, delay in construction works after the vegetation has been cleared will lead to erosion and potential siltation of rivers, especially after a downpour. Other potential sources of impacts are heaping of materials near the river banks, earthworks, blocking and narrowing the river flow at the crossing point to make way for construction of culverts. Such activities may result in flooding, soil erosion, and siltation of the river. Other sources of water pollution are fuelling, washing and servicing of equipment near the river. The effects include sedimentation, changes in biological activity in the river and on its banks, due to contaminated run off from spillage and leakage of petroleum products, among others.

Culverts have been designed for construction along drainage channels to prevent erosion and subsequent siltation of water bodies. It will be ensured that vehicle washing, servicing, fuelling and refuelling are carried out under trays and at designated places away from the river so as to avoid oil spills. Drains will be designed to direct storm water and other run-offs away from the stream. The bulldozer and grader for land clearing and site preparation will be directed to move away from streams as much as possible to prevent dust and loose soil straying into water bodies.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and

- There will be weekly monitoring on the following relevant sources of impacts on the River Gbongbong:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

17.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and

The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

17.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

17.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;

- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

17.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

17.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 12 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

18.0 CHIBRINYO-DUGLI SPOT IMPROVEMENT PROJECT

18.1 Project Environment Information

The project road is located in the Bole District, about 128km from Bole, the district capital. The road is 4.80km long and 3.0m wide with the following communities along the stretch: Chibrinyo, Dugli and Agbadagbo.

There is a school (Chibrinyo Basic School) at 15+000 and about 50m off the road. Another basic school at 7+300, about 30m off the road. The farms along the road are about 100m off the road.

The vegetation type is savannah. The area is generally noted for agriculture (crop cultivation and grazing land for livestock). The area is drained by River Dugli and the Black Volta. The topography is generally flat.

18.2 Project Description

The general state of the road is poor. It is unengineered. The road has poor road surface and structure conditions with numerous, soft spots, depressions, ruts, etc. It also has poor drainage structure and one river crossing point (River Dugli) which has been bridged.

The objective of the proposed spot improvement works includes ensuring all-year-round accessibility at optimum cost, improving access to farming areas, schools, markets and health centres, as well as interconnection between communities like Chibrinyo, Dugli and Agbadagbo

The specific works intended to be carried out are mainly clearing, formation, construction of drainage channels, and lying of sub-base. The specific works (according to mileage (location) and/or distance) are provided in the Table 18.1 below.

Table 18. 1 Locations of Specific Works along Chibrinyo-Dugli Road

	Specific Works	Location or Distance
1	Clearing	0+000-4+6000
2	Formation	0+000-4+600 less emb
3	Construction of drainage structure	11No.
4	Laying of sub-base	3300 m

Clearing involves weeding along the corridor with a dozer. This is expected to widen the width of the road and also allow enough space for other works such as culvert construction. Formation works include blading and compaction of road surface, while laying of sub-base will involve 3.20km of sectional gravelling.

A total of three types of drainage structures, eleven (11) in number, including u-culverts will be constructed along the road. The sizes and numbers are as follows:

a) 8 No. 700 x 900 u-culverts,
b) 2No. 900x1200 u-culvert,
c) 1No. 2/900x1200

The list of types and numbers of equipment/machinery to be used include:

a) 1No. Bulldozer D7 or equivalent,
b) 2No. Motor Grader 140G or equivalent,

c) 1No. Pay Loader (1m^3);
d) 1No. Low Loader
e) 1No. Excavator
f) 2No. Tipper trucks (6m^3);
g) 1No. Water tanker (9000litres);
h) 1No. Vibratory or Static roller (10 tonnes);
i) 1No. Pick-up;
j) 1No. Concrete mixer (0.5m^3); and
k) 1No. Concrete vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - 2970m^3;
b) Aggregates - 180m^3;
c) Portland cement – 700 bags; and
d) Filling material – 3,241m^3

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of ten (10) for the project. The project implementation will take about 10 months.

18.3 Potential Impacts, Mitigation and Monitoring Measures

The Chibrinyor-Dugli Road is unengineered. The current proposed spot improvement project will form part of regular on-going road works to improve and maintain access in the Chibrinyo, Dugli and Agbadagbo communities, and the Bole District in general.

The right of way (RoW) already exists, but the effective width of the road has to a large extent reduced to about 3.0m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah grass within the RoW, formation, construction of drainage channels and lying of sub-base.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on air quality;
2. Noise and vibration impacts;
3. Impacts on water quality;
4. Occupational health and safety risks;
5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

18.3.1 Potential Impacts on Air Quality, Mitigation and Monitoring

It is anticipated that dust may result from tipping and offloading of construction materials such as aggregates (180m^3), gravel for sub-base (2,970m^3), Portland Cement (700 bags) and filling material (3,241m^3). Agitation of earth by a bulldozer during land clearing (0+000-4+6000) and motor grader on the road may result in the transport of dust over long distances beyond their points of generation. These activities are likely to pose some health risks to workers and people at the two basic schools located at chainages 7+300 and 15+000, which are about 30m and 50m respectively off the road. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Drivers would be required to undertake maintenance of their vehicles so as to minimise exhaust emissions. Workers exposed to dust will be provided with nose masks. Water dousing will be undertaken twice daily (morning and afternoon) in the dry season in order to minimize dust concentration in the air.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

18.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The use of equipments like a bulldozer, concrete mixer, motor grader and vibratory roller for activities such as site clearing, construction of a site and compacting of the road would result in noise generation and vibration. These processes may have a direct negative impact on the operators and other workers. These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. Workers exposure to excessive noise may result in auditory fatigue and reduced concentration. Noise may cause learning problems to pupils due to the proximity of the schools located 30m and 50m off the road and the Chibrinyo, Dugli and Agbadagbo communities.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

18.3.3 Potential Impacts on Water Resources, Mitigation and Monitoring

The road crosses River Dugli. This river is an important water body to communities and farmers who depend on it as their main water supply source. It also serves sometimes for minor irrigation purpose and for livestock watering. Since the project will last for about twelve months, delay in construction works after the vegetation has been cleared will lead to soil erosion and siltation of river, especially after a downpour. Excavation for construction of drainage structures can reduce or raise the water table through restricting flow. This may result in flooding of the area and siltation of the river. Siltation can lead to reduced capacity of the river causing eutrophication and eventually drying up of the water body, resulting in the change in hydrological regime of the area. Other potential sources of impacts include contaminated run off from heaped construction materials near the river banks. The river may become contaminated as a result of leakages of petroleum products during fuelling, servicing, and washing of equipment near the river.

Culverts have been designed for construction along drainage channels to prevent erosion and subsequent siltation of water bodies.Drains will be designed to direct storm water and other run-offs away from River Dugli. The bulldozer for land clearing and grader for site preparation will be directed to move away from streams as much as possible to prevent dust and loose soil straying into water bodies. It will be ensured that vehicle washing, servicing, fuelling and refuelling are carried out at designated places and under trays to avoid oil spills.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the River Dugli:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);

- Oil and grease waste from equipment servicing and vehicle washing; and
- Construction of drainage channels and culverts.

18.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and

The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

18.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 2 people from the workforce while the nearby communities nominate 2 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

18.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

18.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

18.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 10 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;

- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

19.0 WUNGU-MISHIO SPOT IMPROVEMENT PROJECT

19.1 Project Environment Information

The project road is located in the West Mamprusi District, about 7.20km from Walewale, the district capital. The road is 17.20km long and 3.0m wide, linking Wungu to Mishio.

There are two basic schools at Wungu (0+330) and Mishio (16+300) respectively. These schools are located 30m off the road. There are wells at Mishio (16+400, 16+500) are 5m off the road. At chainages 8+310-12+000 and 13+800-14+000 are locations of rice farms and they are 15m off the road (RHS). Also along the road is an existing sorghum farm which is 10m off the road.

The vegetation type is savannah. The area is generally noted for agriculture (crop cultivation and grazing land for livestock). The area is drained by drainage channels and the road crossed by River Kpaloo at 13+000. The topography is generally flat.

19.2 Project Description

The state of the road is poor. The road is partially engineered from 0+000 to 17+200 and has poor road surface and structure conditions with numerous, soft spots, depressions, ruts, etc. It also has poor drainage structure and one river crossing point which would require a box culvert.

The objective of the proposed spot improvement works is to facilitate easy transportation of agricultural produce and people living within the road corridor to the nearest market centre and health centres, and to ensure all-year-round accessibility at optimum cost, as well as interconnect Wungu to Mishio.

The specific works intended to be carried out are mainly clearing, formation, construction of drainage channels, and lying of sub-base. The specific works (according to mileage (location) and/or distance) are provided in the Table 19.1 below.

Table 19. 1 Locations of Specific Works along Wungu-Mishio Road

	Specific Works	Location or Distance
1	Clearing	0+100-17+200
2	Formation	16000m
3	Construction of drainage structure	13No.
4	Laying of sub-base	103,200m^2

Clearing involves weeding along the corridor with a dozer. This is expected to widen the width of the road and also allow enough space for other works such as culvert construction. Formation works include blading and compaction of road surface, while laying of sub-base will involve sectional gravelling of the entire road stretch.

Six types of drainage structures, a total of thirteen (13) including u-culverts will be constructed along the road. The sizes and numbers are as follows:

a) 3 No. 700 x 900,
b) 5No. 900x1200,
c) 1No. 2/900x1200
d) 2No. 2/1250x1800
e) 1No.3/ 1250x1800
f) 1No. 3/3mx3m

The list of types and numbers of equipment/machinery to be used include:

a) 1No. Bulldozer D7 or equivalent,
b) 1No. Motor Grader 140G or equivalent,
c) 1No. Pay Loader ($1m^3$);
d) 1No. Low Loader
e) 1No. Excavator
f) 1No. Tipper trucks ($6m^3$);
g) 1No. Water tanker (9000litres);
h) 1No. Vibratory or Static roller (10 tonnes);
i) 1No. Pick-up;
j) 1No. Concrete mixer ($0.5m^3$); and
k) 1No. Concrete vibrator.

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - 15,480 m^3;
b) Aggregates - 400 m^3;
c) Portland Cement- 2400 bags; and
d) Filled Material – 13,514 m^3.

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of seven (7) for the project. The project implementation will take about 12 months.

19.3 Potential Impacts, Mitigation and Monitoring Measures

The Wungu-Mishio Road is partially engineered. The current proposed spot improvement project forms part of regular on-going road works to improve and maintain access in the Wungu and Mishio communities, and the West Mamprusi District in general.

The right of way (RoW) already exists, but the effective width of the road has to a large extent reduced to about 3.0m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah grass within the RoW, formation, construction of drainage channels and laying of sub-base.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade**.).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on air quality;
2. Noise and vibration impacts;
3. Impacts on water quality;
4. Impacts on occupational health impact;
5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts

19.3.1 Potential Impacts on Air Quality, Mitigation and Monitoring

It is likely that dust may originate from tipping and offloading of construction materials such as aggregates (400m^3), gravel for sub-base (15,480m^3), Portland Cement (2400 bags) and filling material (13,514m^3). Agitation of earth by a bulldozer during land clearing (0+100-17+200) and motor grader on the road may result in the transport of dust over long distances beyond their points of generation. These activities are likely to pose some health risks to workers and people at schools in Wungu and Mishio, located at chainages 0+330 and 16+300 respectively, which are 30m off the road. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site. Adverse impacts on air quality are likely to also cause silicosis, asthma attack, etc in the workers and people in the two schools located along the road, when large quantities are inhaled.

Water dousing will be undertaken twice daily (mornings and afternoons) in the dry season, in order to minimize dust concentration in the air. Drivers would be required to undertake preventive maintenance, and also maintain their respective vehicles by their proper servicing (tuning of engine) so as to minimise exhaust emissions. Workers exposed to dust will be provided with nose masks.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

19.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The use of equipments like a bulldozer, concrete mixer, motor grader and vibratory roller for activities such as site clearing, construction of a site and compacting of the road would result in noise generation and vibration. These processes may have a direct negative impact on the operators and other workers. These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. Exposure to excessive noise may result in auditory fatigue and reduced concentration. People in schools at Wungu and Mishio may be susceptible to noise due to the proximity (30m) of their schools to the road.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

19.3.3 Potential Impacts on Water Resources, Mitigation and Monitoring

The road crosses River Kpaloo. This river is an important water body to communities and farmers within the catchment area as their main water supply source. It also serves sometimes for minor irrigation purpose and for livestock watering. It sometimes dries up in the dry season, but it floods in the wet season. Due to the flat nature of the land, large areas become inundated when it floods.

Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality. The construction of a culvert across the River will entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the water course and silt up the waterbed and also affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination.

Culverts have been designed for construction along drainage channels to prevent erosion and subsequent siltation of water bodies. It will be ensured that vehicle washing, servicing, fuelling and refuelling are carried out at designated places and under trays to avoid oil spills. Drains will be designed to direct storm water and other run-offs away from the streams. The bulldozer and grader will be directed to move away from streams as much as possible during land clearing, site preparation and road construction activities, in order to prevent dust and loose soil from straying into River Kpaloo.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and

- There will be weekly monitoring on the following relevant sources of impacts on the River Kpaloo:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

19.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

19.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would

enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 1 person from the workforce while the nearby communities nominate 1 member to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

19.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and

- Toilets decommissioning on project completion.

19.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

19.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 12 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;

- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

20.0 BULBIA – KPASENKPE SPOT IMPROVEMENT PROJECT

20.1 Project Environment Information

The project road is located in the West Mamprusi District, about 30.0km from Walewale, the district capital. The road is 11.40km long and 3.2m wide, linking Bulbia, Dimisi and Kpasenkpe. Located along the road are:

- Public toilet at Bulbia (0+140) about 20m from road;
- Borehole at Dimisi (3+600) about10m from road;
- Groundnut, maize and sorghum farms (4+300 to 4+750);
- Hospital in Walewale; and
- Main market in Walewale.

The vegetation type is savannah and the area is generally noted for agriculture (crop cultivation and grazing land for livestock). The topography is generally flat.

20.2 Project Description

The road is in a poor state, though it was reshaped in June 2009. The road is partially engineered from 0+000 to 10+700 and has poor road surface conditions with numerous, soft spots, depressions, ruts, etc and poor drainage structure.

The objective of the proposed spot improvement works is to facilitate easy transportation of agricultural produce and people living within the road corridor to the nearest market and health centres, and to ensure all-year-round accessibility at optimum cost, as well as interconnection of communities.

The specific works intended to be carried out are mainly clearing, formation, construction of drainage channels, and lying of sub-base. The specific works (according to mileage (location) and/or distance) are provided in the Table 20.1 below.

Table 20. 1 Locations of Specific Works along Bulbia-Kpasenkpe Road

	Specific Works	**Location or Distance**
1	Clearing	0+000-10+700
2	Formation	0+000- 10+700 less emb
3	Construction of drainage structure	17 No.
4	Laying of sub-base	0+000- 10+700

Clearing involves weeding along the corridor with a dozer. This is expected to widen the width of the road and also allow enough space for other works such as culvert construction. Formation works include blading and compaction of road surface, while laying of sub-base will involve sectional gravelling along the entire road stretch.

Two types of drainage structures, a total of seventeen (17) including u-culverts will be constructed along the road. The sizes and numbers are as follows:

a) 16 No. 700 x 900 u-culverts and
b) 1 No. 900x1200 u-culverts.

The list of types and numbers of equipment/machinery to be used include:

a) 1No. Bulldozer D7 or equivalent,
b) 1No. Motor Grader 140G or equivalent,

c) 1No. Pay Loader (1m^3);
d) 1No. Low Loader
e) 1No. Excavator
f) 1No. Tipper trucks (6m^3);
g) 1No. Water tanker (9000 litres);
h) 1No. Vibratory or Static roller (10 tonnes);
i) 1No. Pick-up;
j) 1No. Concrete mixer (0.5m^3); and
k) 1No. Concrete vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - 9630m^3; and
b) Aggregates - 170 m^3
e) Portland cement – 1140bags
c) Filling Material – 5,245 m^3

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of seven (7) for the project. The project implementation will take about 12 months.

20.3 Potential Impacts, Mitigation and Monitoring Measures

The Bulbi-Kpasenkpe Road was reshaped six months ago. The current proposed spot improvement project forms part of regular on-going road works to improve and maintain access in the Builbia, Dimisi and Kpasenkpe communities, and the West Mamprusi District in general.

The right of way (RoW) already exists, but the effective width of the road has to a large extent reduced to about 3.2m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah grass within the RoW, formation, construction of drainage channels and lying of sub-base.

The main beneficial and adverse environmental and social impacts likely to be associated with the project road, as well as the corresponding or mitigation measures are presented in this section.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade**.).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on air quality;
2. Noise and vibration impacts;
3. Impacts on water quality;
4. Public and occupational health risk;
5. Spread of HIV/AIDS and STIs;
6. Waste generation; and
7. Road diversion.

20.3.1 Potential Impacts on Air Quality, Mitigation and Monitoring

Dust may originate from tipping and offloading of construction materials such as aggregates (170m^3), gravel for sub-base (9,630m^3), Portland Cement (1,140 bags) and filling material (5,245m^3). Agitation of earth by a bulldozer during land clearing (0+100-17+200) and motor grader on the road may result in the transport of dust beyond their points of generation. These activities are likely to pose some health risks to workers. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site. Adverse impacts on air quality are likely to also cause silicosis, asthma attack, stress, etc in workers when large quantities are inhaled.

Water dousing will be undertaken twice daily (mornings and afternoons) in the dry season, in order to minimize dust concentration in the air. Drivers would be required to undertake maintenance of their respective vehicles so as to minimise exhaust emissions. Workers exposed to dust will be provided with nose masks.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

20.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The use of equipments like a bulldozer, concrete mixer, motor grader and vibratory roller for activities such as site clearing, construction of a SO and compacting of the road would result in noise generation and vibration. These processes may have a direct negative impact on the operators and other workers. These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. Workers exposure to excessive noise may result in auditory fatigue and reduced concentration. Walewale community and the hospital could also be recipients of noise and vibration.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the

machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from the hospital and to reduce their impacts. Construction works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

20.3.3 Potential Impacts on Water Quality, Mitigation and Monitoring

There are no water bodies along the road corridor. However, a borehole is located at chainage 3+600, which is about 10m off the road. Leakages or spillages of petroleum products from equipment like bulldozer, grader, etc near the borehole may affect the groundwater quality of the borehole. Contamination of such groundwater will be a serious problem due to the difficulty to restore groundwater quality once it is contaminated.

It will be ensured that vehicle washing, servicing, fuelling and refuelling are carried out at designated places to avoid oil spills. Drains will be designed to direct storm water and other run-offs away from the borehole.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out; and
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer.

20.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in

charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and

The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

20.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 1 person from the workforce while the nearby communities nominate 1 member to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and

- There would be monthly checks on records of condoms distributed.

20.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

20.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing

one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

20.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 12 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

21.0 LOAGRI-PRIMA MINOR REHABILITATION PROJECT

21.1 Project Environment Information

The project road is located in the West Mamprusi District, about 110.0km from Walewale, the district capital. The road is 14.50km long, linking communities like Loagri, Sakpaba, and Prima.

The following facilities/resources are located along the strech:

- Public toilet at Loagri (0+350) about 20m from road;
- Borehole at Sakpaba (5+560) about 20m from road,;
- Groundnut, maize and sorghum farms from 2+600 to 2+800; and
- School at Loagri (0+200) about 100m from road.

There is a market and primary school located at chainages 0+300, 5+940 respectively. There are rice, groundnut and sorghum farms at chainages (0+480-0+700), (3+480-3+750), and (6+100-8+940) respectively.

The vegetation type is savannah and the area is generally noted for agriculture (crop cultivation and grazing land for livestock). The topography is generally flat. The River Kuluhi crosses the road at 2+200.

21.2 Project Description

The state of the road is poor. It has not benefitted from any intervention works. The road is unengineered from 0+000 to 14+500 and has poor road surface and structure conditions with numerous, soft spots, depressions, ruts, etc. It also has no drainage structure.

The objective of the proposed minor rehabilitation works is to facilitate easy transportation of agricultural produce and people living within the road corridor to the nearest market and health centres, and to ensure all-year-round accessibility at optimum cost, as well as interconnection of communities.

The specific works intended to be carried out are mainly clearing, formation, construction of drainage channels, and lying of sub-base. The specific works (according to mileage (location) and/or distance) are provided in the Table 21.1 below.

Table 21. 1 Locations of Specific Works along Loagri-Prima Road

	Specific Works	Location or Distance
1	Clearing	0+100 – 12+500
2	Formation	0+000 – 12+500
3	Construction of drainage structure	0+300, 0+400, 0+500, 1+000, 1+400, 1+500, 2+500, 2+700, 2+800, 3+200, 3+500, 3+600, 3+700, 3+800, 4+000, 4+500, 4+600, 4+700, 4+800, 5+700, 5+800, 6+000, 6+200, 6+600, 6+800, 7+300, 7+500, 8+100, 8+500, 8+700, 8+900, 9+000, 9+100, 9+200, 9+300, 9+400, 9+600, 9+800, 10+100, 10+300, 10+500, 10+600, 10+900, 11+200, 11+300, 11+400, 11+600, 11+800, 11+900
4	Laying of sub-base	0+000 – 12+500

Clearing involves weeding along the corridor with a dozer. This is expected to widen the width of the road and also allow enough space for other works such as the construction of drainage structures. Formation works include blading and compaction of road surface, while lying of sub-base will involve gravelling of some sections of the road.

Three types of drainage structures, a total of fifty (50) including u-culverts will be constructed along the road. The sizes and numbers are as follows:

a) 46 No. 700 x 900 u-culverts
b) 1 No. 900x1200 u-culverts, and
c) 3No. 2/900x1200

The list of types and numbers of equipment/machinery to be used include:

a) 1No. Bulldozer D7 or equivalent,
b) 1No. Motor Grader 140G or equivalent,
c) 1No. Pay Loader ($1m^3$);
d) 1No. Low Loader
e) 1No. Excavator
f) 1No. Tipper trucks ($6m^3$);
g) 1No. Water tanker (9000litres);
h) 1No. Vibratory or Static roller (10 tonnes);
i) 1No. Pick-up;
j) 1No. Concrete mixer ($0.5m^3$); and
k) 1No. Concrete vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - $11,250m^3$; and
b) Aggregates - $460m^3$
f) Portland Cement- 3000 bags
c) Filling Material – 16,904 m^3

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of seven (7) for the project. The project implementation will take about12 months.

21.3 Potential Impacts, Mitigation and Monitoring Measures

The Loagri-Prima Road has not benefitted from any improvement works. The current proposed minor rehabilitation project would be part of regular on-going road works to improve and maintain access in the Loagri, Sakpaba, and Prima communities, and the West Mamprusi District in general.

Although the right of way (RoW) already exists, the effective width of the road has to a large extent reduced to about 3.0m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah grass within the RoW, formation, construction of drainage structures and laying of sub-base.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.

With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on air quality;
2. Noise and vibration impacts;
3. Impacts on water quality;
4. Public and occupational health and safety risk;
5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts

21.3.1 Potential Impacts on Air Quality, Mitigation and Monitoring

Clearing of savannah vegetation along the road (00+100-12+500) with a bulldozer, formation works with a motor grader (00+100-12+500), tipping and offloading of construction materials such as filling material (16,904m^3), aggregates (460m^3), Portland Cement (3000 bags) and gravel for sub-base (11,250m^3) will generate dust in the immediate environment. Dust may be transported by air currents beyond their points of generation and be deposited at a school in Loagri (which is at chainage 0+200 and100m off the road) and on groundnut, maize and sorghum farms (at chainage 2+600-2+800 off the road). Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site. Persons exposed to dust and exhaust fumes are liable to suffer from upper respiratory tract infections such as silicosis, bronchitis, etc when large quantities are inhaled. Deposition of dust and particulates may also inhibit plant growth.

Workers exposed to dust will be provided with nose masks. The drivers would be required to properly service their equipment and machinery so that the exhaust emissions are brought under control. All heaped sand will be covered, and water dousing will be undertaken twice daily (morning and afternoon) in the dry season, in order to minimize dust concentration in the air.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

21.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The use of equipments like a bulldozer, concrete mixer, motor grader and vibratory roller for activities such as site clearing, construction of a SO and compacting of the road would result in noise generation and vibration. These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. These processes may have a direct negative impact on the operators and other workers. Exposure to excessive noise may result in auditory fatigue and reduced concentration. People in the Loagri School may be susceptible to noise due to the proximity of the school to the road (at chainage 0+200 and 100m off the road).

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

21.3.3 Potential Impacts on Water Resources, Mitigation and Monitoring

The road crosses River Kuhuli at chainage 2+200. There is also a borehole located at chainage 5+560 and about 20m off the road. These water resources serve significant purposes for the communities such as for household use, minor irrigation and livestock watering

Spot improvement works may result in deterioration in water quality of River Kuhuli and the borehole. Delay in construction works after the vegetation has been cleared will make the area susceptible to sheet erosion, especially after a downpour. This will lead to soil particles being put in suspension in the river. Blocking and narrowing the river flow at the crossing point to make way for construction of culverts may lead to flooding upstream, and water shortage downstream. Leakages and spillages of petroleum products during vehicle fuelling, servicing and washing may affect water quality of the river and borehole when such activities occur close to these water resources.

Culverts have been designed for construction along drainage channels to prevent erosion and subsequent siltation of water bodies. It will be ensured that vehicle washing, servicing, fuelling and refuelling are carried out at designated places and under trays to avoid oil spills. Drains will be designed to direct storm water and other run-offs away from the streams. The bulldozer and grader will be directed to move away from streams as much as possible during land clearing, site preparation and road construction activities, in order to prevent dust and loose soil from straying into River Kuhuli.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the River Kuhuli:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

21.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;

- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

21.3.4 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 1 person from the workforce while the nearby communities nominate 1 member to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

21.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will

be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

21.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

21.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 12 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the

contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

22.0 SOO JUNCTION-SOO SPOT IMPROVEMENT PROJECT

22.1 Project Environment Information

The project road is located in the West Mamprusi District, about 113.0km from Walewale, the district capital. The road is 9.20km long and 2.6m wide, linking Soo Junction to Soo.

The following are located along the stretch: groundnut, maize, millet and sorghum farms from (0+490 to 0+600), (3+600-3+900), (5+000-5+500).

The vegetation type is savannah and the area is generally noted for agriculture (crop cultivation and grazing land for livestock. The topography is generally flat.

22.2 Project Description

The state of the road is poor. It is unengineered from 0+000 to 9+200 and has poor road surface and structure conditions with numerous, soft spots, depressions, ruts, etc. It also has no drainage structure.

The objective of the proposed spot improvement works is to facilitate easy transportation of agricultural produce and people living within the road corridor to the nearest market and health centres, and to ensure all-year-round accessibility at optimum cost.

The specific works intended to be carried out are mainly clearing, formation, construction of drainage channels, and lying of sub-base. The specific works (according to mileage (location) and/or distance) are provided in the Table 22.2 below.

Table 22. 1 Locations of Specific Works along Soo Junction-Soo Road

	Specific Works	Location or Distance
1	Clearing	0+000-9+000
2	Formation	6500m
3	Construction of drainage structure	25No.
4	Laying of sub-base	(0+000-3+500),(4+600-5+600),(6+600-9+000)

Clearing involves weeding along the corridor with a dozer. This is expected to widen the width of the road and also allow enough space for other works such as culvert construction. Formation works include blading and compaction of road surface, while lying of sub-base will involve gravelling of some sections of road.

Two types of drainage structures, a total of twenty five (25) including u-culverts will be constructed along the road. The sizes and numbers are as follows:

a) 24 No. 700 x 900 u-culverts, and
b) 1 No. 900x1200 u-culverts.

The list of types and numbers of equipment/machinery to be used include:

a) 1No. Bulldozer D7 or equivalent,
b) 1No. Motor Grader 140G or equivalent,
c) 1No. Pay Loader ($1m^3$);
d) 1No. Low Loader
e) 1No. Excavator
f) 1No. Tipper trucks ($6m^3$);
g) 1No. Water tanker (9000litres);

h) 1No. Vibratory or Static roller (10 tonnes);
i) 1No. Pick-up;
j) 1No. Concrete mixer ($0.5m^3$); and
k) 1No. Concrete vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - $6210m^3$;
b) Aggregates - $260m^3$; and
c) Filling Material – 6,636 m^3.

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of seven (7) for the project. The project implementation will take about 12 months.

22.3 Potential Impacts, Mitigation and Monitoring Measures

The Soo Junction-Soo Road is unengineered. The current proposed spot improvement project would be part of regular on-going road works to improve and maintain access to Soo, and the West Mamprusi District in general.

Although the right of way (RoW) already exists, the effective width of the road has to a large extent reduced to about 2.6m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah grass within the RoW, formation, construction of drainage structures and lying of sub-base.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on air quality;
2. Noise and vibration impacts;
3. Impacts on water resources;
4. Public and occupational health and safety risks;
5. Spread of HIV/AIDS and STIs;

6. Waste generation; and
7. Road diversions; and
8. Temporary site office impacts.

22.3.1 Potential Impacts on Air Quality, Mitigation and Monitoring

Clearing of savannah vegetation along the road (0+000-9+000) with a bulldozer, formation works with a motor grader (00+100-12+500), tipping and offloading of construction materials such as filling material (6,636m^3), aggregates (260m^3), and gravel for sub-base (6,210m^3) will generate dust in the immediate environment. Dust may be transported by air currents and be deposited on the groundnut, maize and millet farms at chainages (0+490-0+600), (3+600-3+900), (5+000-5+500). Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site. Deposition of dust and particulates may also inhibit plant growth on farms located along the road.

Workers exposed to dust will be provided with nose masks. The drivers would be required to undertake servicing/maintenance so that the exhaust emissions are brought under control. All heaped sand will be covered, and water dousing will be undertaken twice daily (morning and afternoon) in the dry season, in order to minimize dust concentration in the air.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

22.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The use of equipment like a bulldozer, concrete mixer, motor grader and vibratory roller for activities such as site clearing, construction of a SO and compacting of the road would result in noise generation and vibration. These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. These processes may have a direct negative impact on the operators and other workers. Exposure to excessive noise may result in auditory fatigue and reduced concentration. No community will however be affected.

A noise survey would be undertaken to determine workers exposure and construction equipment noise emission. Machine operators and other workers close to noise sources would be provided with ear plugs or ear muffs. Controlling hours of exposure to noise and vibration will be limited to not more than 3 hours in a day. All machines/vehicles would be serviced regularly. Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance. The proper maintenance of machines by lubrication and timely replacement of bearings would be pursued.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

22.3.3 Potential Impacts on Water Resources, Mitigation and Monitoring

The road corridor is devoid of any water resource. It is therefore, unlikely that the spot improvement works will affect water quality. However, the contractor will ensure that activities of the project are carried out in an environmentally sound manner.

Culverts have been designed for construction along drainage channels to prevent erosion and subsequent siltation of water bodies. It will be ensured that vehicle washing, servicing, fuelling and refuelling are carried out at designated places and under trays to avoid oil spills. Drains will be designed to direct stormwater and other run-offs away from the streams. The bulldozer and grader will be directed to move away from streams as much as possible during land clearing, site preparation and road construction activities, in order to prevent dust and loose soil from straying into River Kuhuli.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out; and
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer.

22.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;

- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

22.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

22.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by

workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

22.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

22.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 12 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

ROADS IN BRONG AHAFO REGION

23.0 KUPONGKROM-SALAMKROM-KYEKYEWERE, YEPIMSO JUNCTION–KYEKYEWERE ROAD MINOR REHABILITATION

23.1 Project Environment Information

The project road is located in the Nkoranza South District, about 24km from Nkoranza, the district capital. The total length of the road is 13.5km with the following communities along the stretch: Kupongkrom, Salamkrom and Kyekyewere.

There are farms which are about 10m away along the road corridor at Kupongkrom road (chainages 1+600-5+100, 5+400-7+800) and at Yepimso road (chainage 0+200-2+100,2+400-3+900,4+000-4+700). The vegetation type is Savannah bush. The area is generally noted for agriculture. There are a total of 19 drainage channels. The road is crossed by the River Patuda. The topography is generally undulating.

23.2 Project Description

The state of the road is poor. There are no records of rehabilitation works on the road. The width of the Kupongkrom-Salamkrom-Kyekyewere road is reduced to 3.5m and that of Yepimso Junction-Kyekyewere is reduced to 3.0m on the average (instead of 6.0m). Gullies have developed along some sections of the road.

The objective of the proposed minor rehabilitation works includes improving access to farming areas, schools, markets and health centres as well as interconnection between communities.

The specific works intended to be carried out are mainly clearing, formation, construction of culverts, filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table 23.1 below;

Table 23. 1 Locations of Specific Works along Kupongkrom-Kyekyewere, Kyekyewere Road

	Specific Works	Location or Distance
1	Clearing	0+000-8+800 and 0+000-4+700
2	Formation	0+000-8+800 and 0+000-4+700
3	Construction of culverts	Rd 1:1+900,2+300,2+500,2+550,4+600,4+800,5+900,7+300,7+900,8+700
		Rd 2:0+700,1+100,1+800,2+200,2+400,2+500,2+900,3+100
4	Filling and gravelling	50m on both sides of each culvert approach

Clearing involves weeding or light bush removal along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction, formation works which include blading and drains. Three (3) types of new 'U' shaped culverts will be constructed, eighteen (18) in number along the road. The sizes and numbers are as follows:

a) 15 No. 900x700;
b) 1 No. 1200x900;
c) 2No. 600x600.

Filling will be done mainly in the approaches of culverts and also of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

a. 1No.Bulldozer;

b. 1No. Motor Grader;
c. 1No. Concrete mixer.

The type of raw materials and the estimated quantities will include:

a. Portland cement (27.8m3);
b. Fine aggregates (58.9m^3);
c. Coarse aggregates (103 m^3);
d. Gravel (87,120m3); and
e. Filling material (3,112m^3).

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty (20) to thirty (30) for the project. The project implementation will take about six (6) months.

23.3 Potential Impacts, Mitigation and Monitoring Measures

This road has not seen any rehabilitation works since it was created. The current proposed minor rehabilitation project is the start of regular road maintenance works to be carried out to improve and maintain access in the Kupongkrom, Salamkrom, Kyekyewere and Yepimso Junction communities in particular, and the Nkoranza South District in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 3.5m at the Kupongkrom-Salamkrom-Kyekyewere section and 3.0 at the Yepimso Junction – Kyekyewere section will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah grass within the RoW, construction of culverts along the drainage channels and at the Patuda River crossing.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;

4. Occupational health and safety hazards;
5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts

23.3.1 Impacts on Water Resources, Mitigation and Monitoring

The road crosses the Patuda River. This is an important water body to communities and farmers whose farms are close to it and use it as their main water supply source.

The construction of a culvert across the Patuda will entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the water course and silt up the waterbed as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size, improved channelling and pitching to direct and contain the Patuda, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs.Clearing of grass along the road corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered with tarpaulin.

Excavated materials will be retained away from the river and covered to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on any water body:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

23.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 13.5km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and

- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt mainly by the workers and members of the Kupongkrom, Salamkrom and Kyekyewere communities.

Impact of noise will be localised at the operational sites on workers. Noise protection devices such as ear muffs and plugs will be provided to all workers on site. The use of the protection device by workers will be mandatory at all work sites. The Site Engineer will be accountable for any instance of non-compliance.

Workers exposed to loud noise and vibration by working with noisy and vibrating machines such asconcrete mixer and vibratory or static rollerrespectively will not be allowed to work for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and available for inspection to ensure optimal noise generation. The static machines will be sited at least 100m away from homes to reduce their impacts. Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance. Idle equipment will immediately be shut down.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

23.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along portions of the road that pass through communities to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

23.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and

- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

23.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

23.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting; and
- Daily inspection of work site to detect indiscriminate defecation.

23.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

23.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 6 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

24.0 WEILA-GUMBOI-DWERE ROAD SPOT IMPROVEMENT WORKS

24.1 Project Environment Information

The project road is located in the Kintampo North Municipality, 26km from Kintampo, the municipal capital. The road is 7.7km long with the following communities along the stretch: Weila, Gumboi, and Dwere.

There are farms which are about 25m away along the road corridor (0+50-0+150 and 6+200-6+450). There is a school at chainage 7+700 ie in the Dwere community. The vegetation type is savannah bush. The area is generally noted for agriculture (crop cultivation). The area has 3 drainage channels and, the road is crossed by the River Dadaa and River Contraje. The topography is generally undulating.

24.2 Project Description

The current state of the road is fair. There was maintenance works carried out on the road in 2001. The width of the road is reduced to 3.5m on the average (instead of 6.0m). Some sections are low-lying and sandy making vehicular movement difficult during rainy seasons.

The objective of the proposed spot improvement works include improving access to farming areas, schools, markets and health centres as well as interconnection between communities.

The specific works intended to be carried out are mainly clearing, formation, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table 24.1 below.

Table 24. 1 Locations of Specific Works along Weila-Gumboi-Dwere Road

	Specific Works	Location or Distance
1	Clearing	0+000-7+700
2	Formation	0+000-7+700
3	Construction of culverts	7+400,7+500,7+650 and 7+700
4	Filling and gravelling	0+300-0+350,1+500-1+650,4+100-4+300,and culvert approaches

Clearing involves weeding or light bush removal along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction, formation works which include blading and drains. One (1) type of new 'U' shaped culvert will be constructed, four (4) in number along the road. The size of the culverts will be 900 x700.

Filling will be done mainly in the approaches of culverts and also at low-lying areas of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

a. 1No.Bulldozer;
b. 1No. Motor Grader;
c. 1No. Concrete mixer;

The type of raw materials and the estimated quantities will include:

a. Portland cement (5.6m3)
b. Fine aggregates (21.32m^3);
c. Coarse aggregates (38.44 m^3);
d. Gravel (60,480m^3);
e. Filling material (1,996m^3);

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty (20) to thirty (30) for the project. The project implementation will take about six (6) months.

Figure 24. 1 Typical Bad Sections of the Road

24.3 Potential Impacts, Mitigation and Monitoring Measures

Routine maintenance works were carried out on the Weila-Gumboi-Dwereroad in 2001. The current proposed spot improvement project is part of regular on-going road works to improve and maintain access in the Weila, Gumboi and Dwere communities in particular, and the Kintampo North Municipality in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 3.5m will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah bush within the RoW, construction of four (900x700) 'U' shaped culverts along the drainage channels and at the Dadaa and Contraje River crossings.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety hazards;
5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

24.3.1 Impacts on Water Resources, Mitigation and Monitoring

The road crosses the Dadaa and Contraje Rivers. These are important water bodies to communities and farmers whose farms are close to them and use them as their main water supply sources.

The construction of culverts across the Dadaa and Contraje will entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the water course and silt up the waterbed as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culverts construction design incorporate measures such as adequate size, improved channelling and pitching to direct and contain the Dadaa and Contraje, to prevent overflow or erosion of the adjoining roads, thereby avoiding siltation of the water bodies. Drains will direct storm-water and run-offs.Clearing of grass along the road corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered with tarpaulin.

Excavated materials will be retained away from the rivers and covered to avoid possible losses into the watercourses. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the River Dadaa and Contraje:
  - Sediment-laden run-off from cleared areas of road;

- Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
- Oil and grease waste from equipment servicing and vehicle washing; and
- Construction of drainage channels and culverts.

24.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 7.7km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt by the workers and Weila, Gumboi, and Dwere communities.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from the clinic to reduce their impacts. Construction works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

24.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected

along portions of the road that pass through communities to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

24.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;

- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

24.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

24.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and

surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

24.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

24.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite

of the short duration of 6 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

25.0 KWAMETENTE-JARO-NSUHUNU ROAD MINOR REHABILITATION WORKS

25.1 Project Environment Information

The project road is located in the Tain District, about11.2km from Nsawkaw, the district capital. The total stretch of the road is 9.6 km long with the following communities along the stretch: Kwametente, Jaro and Nsuhunu.

There are farms located about 10m away along the road corridor (5+550-5+700,10+100-10+300). The vegetation type is light bush. The area is generally noted for agriculture (crop cultivation). The area has a total of four (4) drainage channels and the topography is generally undulating.

25.2 Project Description

The state of the road is poor. It has not benefitted from any rehabilitation works. The width of the road is reduced to 3.0m on the average (instead of 6.0m). Gullies have developed along some sections of the road making vehicular passage difficult.

The objective of the proposed minor rehabilitation works include improving access to farming areas, schools, markets and health centres as well as interconnection between communities.

The specific works intended to be carried out are mainly clearing, formation, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in the Table 25.1 below;

Table 25. 1 Locations of Specific Works along Kwametente-Jaro-Nsuhunu Road

	Specific Works	Location or Distance
1	Clearing	0+000-9+600
2	Formation	0+000-9+600
3	Construction of culverts	0+000,0+350,0+700,1+350,1+800,2+100,3+150,3+600,3+900,4+100,4+850,5+700, 6+200,7+400,8+000,8+600,9+000,9+200,9+600
4	Filling and gravelling	50m on both sides of each culvert approach

Clearing involves weeding or light bush removal along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction, formation works which include blading and drains. Two (2) types of new 'U' shaped culverts will be constructed, nineteen (19) in number along the road. The sizes and numbers are as follows:

a. 16 No. 900x700
b. 3No. 1200x900

Filling will be done mainly in the approaches of culverts and also of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

a. 1No.Bulldozer,
b. 1No. Motor Grader,
c. 1No. Concrete mixer

The type of raw materials and the estimated quantities will include:

a. Portland cement (29.0m3)
b. Fine aggregates (60.5.0m^3);

c. Coarse aggregates (84.0 m^3);
d. Gravel (69,120m^3), and
e. Filling Material (6,080m^3),

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty (20) to thirty (30) for the project. The project implementation will take about six (6) months.

25.3 Potential Impacts, Mitigation and Monitoring Measures

This road has not seen any rehabilitation works since it was created. The current proposed minor rehabilitation project is the start of regular road maintenance works to be carried out to improve and maintain access in Kwametente, Jaro and Nsuhunu the communities in particular, and the Tain District in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 3.0m will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of light bush within the RoW, construction of sixteen (900x700) and three (1200x900) 'U' shaped culverts along the drainage channels.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Noise and vibration impacts;
2. Dust generation and impact on air quality;
3. Occupational and public health and safety hazards;
4. Spread of HIV/AIDS and STIs;
5. Waste generation;
6. Road diversion; and
7. Temporary site office impacts.

25.3.1 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 9.6 km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt by the workers and members of Kwametente, Jaro and Nsuhunu communities.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

25.3.2 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along portions of the road that pass through communities to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

25.3.3 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and

- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

25.3.4 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

25.3.5 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

25.3.6 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

25.3.7 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 6 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or

may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

26.0 SUBINSO-BOASE ROAD MINOR REHABILITATION WORKS

26.1 Project Environment Information

The project road is located in the Wenchi Municipality, about 28.5km from Wenchi the district capital. The road is 4.4 km long with Subinso and Boase communities along the stretch.

There are farms which are about 20m away along the road corridor (Chainage 2+200-2+600). The vegetation type is savannah bush. The area is generally noted for agriculture (crop cultivation). The area has 3 drainage channels and the road crossed the Bopera and Kondwan Rivers. The topography is generally undulating.

26.2 Project Description

The current state of the road is poor. The road underwent some reshaping works in 2004. The width of the road is reduced to 3.0m on the average (instead of 6.0m). There are two stream crossings which are not bridged making vehicular movement difficult during rainy seasons.

The objective of the proposed minor rehabilitation works include improving access to farming areas, schools, markets and health centres as well as interconnection between communities.

The specific works intended to be carried out are mainly clearing, formation, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in the Table 26.1 below.

Table 26. 1 Locations of Specific Works along Subinso-Boase Road

	Specific Works	Location or Distance
1	Clearing	0+000-4+400
2	Formation	0+000-4+400
3	Construction of culverts	0+300,0+500,0+700,1+100,3+300,4+400
4	Filling and gravelling	50m on both sides of each culvert approach

Clearing involves weeding or light bush removal along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction, formation works which include blading and drains. Three (3) types of new culverts will be constructed, six(6) in number along the road. The sizes and numbers are as follows:

a. 4 No. 900x700;
b. 1 No. 1800x1800;
c. 1 No. 2/1800x1800;

Filling will be done mainly in the approaches of culverts and also of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

a. 1No.Bulldozer;
b. 1No. Motor Grader;
c. 1No. Concrete mixer.

The type of raw materials and the estimated quantities will include:

a) Portland cement (16.0m^3);

b) Fine aggregates (30.8m^3);
c) Coarse aggregates (48.13 m^3);
d) Gravel (33,120m^3); and
e) Filling material (2,929m^3).

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty (20) to thirty (30) for the project. The project implementation will take about six (6) months.

26.3 Potential Impacts, Mitigation and Monitoring Measures

Routine maintenance works were carried out on the Subinso-Boaseroad in 2004. The current proposed minor rehabilitation project is part of regular on-going road works to improve and maintain access in the Subinso and Boase communities in particular, and the Wenchi Municipality in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 3.0m will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of savannah grass within the RoW, construction of 4 (900x700), 1 (1800x1800) and 1(2/1800x1800) culverts along the drainage channels and at the Bopera and Kondwan River crossings.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety hazards;
5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts

26.3.1 Impacts on Water Resources, Mitigation and Monitoring

The road crosses the Bopera and Kondwan Rivers. These are important water bodies to communities and farmers whose farms are close to it and use it as their main water supply sources.

The construction of culverts across the Bopera and Kondwan will entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the water courses and silt up the waterbed as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culverts construction design incorporate measures such as adequate size, improved channelling and pitching to direct and contain the Bopera and Kondwan, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water bodies. Drains will direct storm-water and run-offs.Clearing of grass along the road corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered with tarpaulin.

Excavated materials will be retained away from the rivers and covered to avoid possible losses into the watercourses. The timing for culverts construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the rivers. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the Rivers Bopera and Kondwan:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

26.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 4.4 km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt by the workers and the Subinso and Boase communities.

Impact of noise will be localised at the operational sites on workers. Noise protection devices such as ear muffs and plugs will be provided to all workers. The use of the protection device by workers will be mandatory at all work sites. The Site Engineer will be accountable for any instance of non-compliance.

Workers exposed to loud noise and vibration by working with noisy and vibrating machines such as concrete mixer and vibratory or static roller respectively will not be allowed to work for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and available for inspection to ensure optimal noise generation. The static machines will be sited at least 100m away from homes to reduce their impacts. Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance. Idle equipment will immediately be shut down.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

26.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along portions of the road that pass through communities to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;

- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

26.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

26.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

26.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;

- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

26.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

26.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 6 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

27.0 SAMPANO-KWAJILOGO-KWAKUDONKOR ROAD MINOR REHABILITATION WORKS

27.1 Project Environment Information

The project road is located in the Tain District, about 51.0km from Nsawkaw, the district capital. The road is 6.0km long with the following communities along the stretch; Sampano, Kwajilogo, Kwaku Donkor.

There are farms which are about 20m away along the road corridor (Chainage 0+000-0+300, 1+300-1+700). There is a school at chainage 3+500 in Kwajilago community.

The vegetation type is light bush. The area is generally noted for agriculture (crop cultivation). The area has 9 drainage channels. The topography is generally undulating.

27.2 Project Description

The state of the road is poor. No rehabilitation works has been carried out on the road. The width of the road is reduced to 3.0m on the average (instead of 6.0m). The approaches of the drainage channels are clayey and muddy during rainy seasons making vehicular movement difficult.

The objective of the proposed minor rehabilitation works include improving access to farming areas, schools, markets and health centres as well as interconnection between communities.

The specific works intended to be carried out are mainly clearing, formation, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table 27.1 below.

Table 27. 1 Locations of Specific Works along Sampano-Kwajilogo-KwakuDonkor Road

	Specific Works	Location or Distance
1	Clearing	6+000-12+000
2	Formation	6+000-12+000
3	Construction of culverts	6+100,6+400,6+500,6+600,6+700,7+850,8+200,8+500,8+800,8+950, 9+200,9+500,11+100,12+000
4	Filling and gravelling	50m on both sides of each culvert approach

Clearing involves weeding or light bush removal along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction, formation works which include blading and drains. Three (3) types of new 'U' shaped culverts will be constructed, fourteen (14) in number along the road. The sizes and numbers are as follows:

a. 10 No. 900x700;
b. 3 No. 1200x900;
c. 1No. 2/1200x900.

Filling will be done mainly in the approaches of culverts and also of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

a. 1No.Bulldozer;
b. 1No. Motor Grader;
c. 1No. Concrete mixer.

The type of raw materials and the estimated quantities will include:

a) Portland cement (23.8m3);
b) Fine aggregates (47.63m^3);
c) Coarse aggregates (65.2m^3);
d) Gravel (43,200m^3); and
e) Filling Material (5,010m^3)

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty (20) to thirty (30) for the project. The project implementation will take about six (6) months.

27.3 Potential Impacts, Mitigation and Monitoring Measures

No rehabilitation works has been done on the Sampano-Kwajilogo-Kwaku Donkor Road since it was created. The current proposed minor rehabilitation project is the beginning of regular rehabilitation works to be undertaken on the road. This will improve and maintain access in the Sampano, Kwajilogo and Kwaku Donkor communities in particular, and the Tain District in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 3.0m will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of light bush within the RoW, construction of 10(900x700); 3(1200x900); and 1(2/1200x900) culverts along the nine drainage channels.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Noise and vibration impacts;
2. Dust generation and impact on air quality;
3. Occupational health and safety hazards;
4. Spread of HIV/AIDS and STIs;
5. Waste generation;
6. Road diversion; and
7. Temporary site office impacts.

27.3.1 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 6.0km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt by the workers and the Sampano, Kwajilogo, KwakuDonkor communities.

Impact of noise will be localised at the operational sites on workers. Noise protection devices such as ear muffs and plugs will be provided to all workers. The use of the protection device by workers will be mandatory at all work sites. The Site Engineer will be accountable for any instance of non-compliance.

Workers exposed to loud noise and vibration by working with noisy and vibrating machines such as concrete mixer and vibratory or static rollerrespectively will not be allowed to work for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and available for inspection to ensure optimal noise generation. The static machines will be sited at least 100m away from homes to reduce their impacts. Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance. Idle equipment will immediately be shut down.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

27.3.2 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along portions of the road that pass through communities to control dust generation. Construction

trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

27.3.3 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;

- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

27.3.4 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

27.3.5 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream

or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

27.3.6 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

27.3.7 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite

of the short duration of 6 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

28.0 WRUKWAI JUNCTION-WRUKWAI-KUNSU ROAD MINOR REHABILITATION WORKS

28.1 Project Environment Information

The project road is located in the Kintampo North Municipality, about 28.8km from Kintampo, the municipal capital. The length of the road is 9.1 km long with Wrukwai and Kunsu communities along the stretch.

There are farms which are about 25m away along the road corridor (0+000-0+). There is a school and market at chainage 0+000 in the Kunsu community.

The vegetation type is light bush. The area is generally noted for agriculture (crop cultivation). The area has 6 drainage channels and the topography is generally undulating.

28.1 Project Description

The state of the road is poor. It has not benefitted from any previous rehabilitation works. The width of the road is reduced to 2.0m on the average (instead of 6.0m). There are sandy sections which make movement difficult during rainy seasons.

The objective of the proposed minor rehabilitation works include improving access to farming areas, schools, markets and health centres as well as interconnection between communities.

The specific works intended to be carried out are mainly clearing, formation, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in the Table 28.1 below.

Table 28. 1 Locations of Specific Works along Wrukwai Junction-Wrukwai-Kunsu Road

	Specific Works	Location or Distance
1	Clearing	0+000-9+100
2	Formation	0+000-9+100
3	Construction of culverts	0+500,1+200,1+450,1+800,2+500,2+600,2+700,2+800,3+000,3+200,4+200,4+400,4+500,4+800,5+300,5+400,6+500,6+600,6+700,7+600,8+400,8+600,8+650
4	Filling and gravelling	50m on both sides of each culvert approach

Clearing involves weeding or light bush removal along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction formation works which include blading and drains. One (1) type of new 'U' shaped culvert will be constructed, 23 in number along the road. The size of the culverts will be 900x700.

Filling will be done mainly in the approaches of culverts and also of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

a. 1No.Bulldozer;
b. 1No. Motor Grader; and
c. 1No. Concrete mixer.

The type of raw materials and the estimated quantities will include:

a. Portland cement ($32.2m^3$);

b. Fine aggregates (80.74m^3);
c. Coarse aggregates (128.95 m^3);
d. Gravel (65,520m^3); and
e. Filling Material (7,499m^3).

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty (20) to thirty (30) for the project. The project implementation will take about six (6) months.

28.3 Potential Impacts, Mitigation and Monitoring Measures

The Wrukwai Junction-Wrukwai-Kunsu Road has not benefitted from any rehabilitation works since its creation. The current proposed minor rehabilitation project will be the beginning of a regular maintenance works to be done on this road. This rehabilitation works will improve and maintain access in the Wrukwai Junction, Wrukwai and Kunsu communities in particular, and the Kintampo North Municipality in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 2.0m will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of light bush within the RoW, construction of 23 (900x700) 'U' shaped culverts along the drainage channels.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Noise and vibration impacts;
2. Dust generation and impact on air quality;
3. Occupational/public health and safety hazards;
4. Spread of HIV/AIDS and STIs;
5. Waste generation;
6. Road diversion; and
7. Temporary site office impacts

28.3.1 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 9.1 km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt by the workers and Wrukwai and Kunsu communities.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from schools to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

28.3.2 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along portions of the road that pass through communities to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled

book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

28.3.3 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;

- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

28.3.4 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

28.3.5 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will

be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

28.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

28.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 6 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the

contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

29.0 HANI-NAMASA ROAD MINOR REHABILITATION WORKS

29.1 Project Environment Information

The project road is located in the Tain District, about 19.0km from Nsawkaw, the district capital. The length of the road is 6.6 km long with Hani and Namasa communities along the stretch.

There are farms which are about 10m away along the road corridor (Chainage 5+700-6+000). The vegetation type is light bush. The area is generally noted for agriculture (crop cultivation). The area has 3 drainage channels and one stream channel by name River Nimpene. The topography is generally undulating.

29.2 Project Description

The state of the road is poor. No rehabilitation works has been undertaken on it previously. The width of the road is reduced to 3.0m on the average (instead of 6.0m). The unbridged stream crossing makes human and vehicular passage difficult and risky during rainy seasons.

The objective of the proposed minor rehabilitation works include improving access to farming areas, schools, markets and health centres as well as interconnection between communities.

The specific works intended to be carried out are mainly clearing, formation, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in the Table 29.1 below.

Table 29. 1 Specific Works and their Locations along Hani-Namasa Road

	Specific Works	Location or Distance
1	Clearing	0+000-6+600
2	Formation	0+000-6+600
3	Construction of culverts	0+300,0+900,1+150,1+800,1+850,2+200,3+200,3+800,3+900,5+300,5+500,5+700,6+200,6+400,7+400
4	Filling and gravelling	0+000-0+300 and 50m on both sides of each culvert approach

Clearing involves weeding or light bush removal along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction, formation works which include blading and drains. Two (2) types of new culverts will be constructed, fifteen (15) in number along the road. The sizes and numbers are as follows:

a. 12 No. 900x700;
b. 3 No. 1200x900;

Filling will be done mainly in the approaches of culverts and also low-lying areas of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

a. 1No.Bulldozer;
b. 1No. Motor Grader;
c. 1No. Concrete mixer.

The type of raw materials and the estimated quantities will include:

a. Portland cement (23.4m^3);
b. Fine aggregates (50.3m^3);
c. Coarse aggregates (70.26 m^3);

d. Gravel (57,600m^3); and
e. Filling material (247m^3).

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty (20) to thirty (30) for the project. The project implementation will take about six (6) months.

29.3 Potential Impacts, Mitigation and Monitoring Measures

The Hani-Namasa road has not benefitted from any rehabilitation works since its creation. The current proposed minor rehabilitation project will be the beginning of regular maintenance works to be done on this road. This rehabilitation works will improve and maintain access in the Hani and Namasa communities in particular, and the Tain District in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 3.0m will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of light bush within the RoW, construction of 12 (900x700) and 3 (1200x900) 'U' shaped culverts along the drainage channels and at the Nimpene River crossing.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety hazards;
5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

29.3.1 Impacts on Water Resources, Mitigation and Monitoring

The road crosses the Nimpene River. This is an important water body to communities and farmers whose farms are close to it and use it as their main water supply source.

The construction of a culvert across the Nimpene will entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into the water course and silt up the waterbed as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size, improved channelling and pitching to direct and contain the Nimpene, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs.Clearing of grass along the road corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered with tarpaulin.

Excavated materials will be retained away from the river and covered to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the River Nimpene:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

29.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 6.6 km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels

by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt by the workers and Hani and Namasa communities.

Impact of noise will be localised at the operational sites on workers. Noise protection devices such as ear muffs and plugs will be provided to all workers. The use of the protection device by workers will be mandatory at all work sites. The Site Engineer will be accountable for any instance of non-compliance.

Workers exposed to loud noise and vibration by working with noisy and vibrating machines such as concrete mixer and vibratory or static roller respectively will not be allowed to work for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and available for inspection to ensure optimal noise generation. The static machines will be sited at least 100m away from homes to reduce their impacts. Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance. Idle equipment will immediately be shut down.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

29.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along portions of the road that pass through communities to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;

- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

29.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

29.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would

enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

29.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and

- Toilets decommissioning on project completion.

29.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

29.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 6 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;

- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

30.0 NAMASA-BROHANI ROAD MINOR REHABILITATION WORKS

30.1 Project Environment Information

The project road is located in the Tain District, about 25.6km from Nsawkaw, the district capital. The length of the road is 11.8 km with Namasa and Brohani communities along the stretch.

There are farms which are about 10m away along the road corridor (Chainages 1+100-1+800, 2+000-2+200 and 5+400-5+500). There is a school in Brohani at chainage 11+800.

The vegetation type is light bush. The area is generally noted for agriculture (crop cultivation). The area has 3 main drainage channels. The topography is generally undulating.

30.2 Project Description

The state of the road is poor. No previous rehabilitation works has been undertaken on the road. The width of the road is reduced to 2.5m on the average (instead of 6.0m). There are gullies at some sections of the road which make vehicular movement difficult.

The objective of the proposed minor rehabilitation works include improving access to farming areas, schools, markets, health centres as well as interconnection between communities.

The specific works intended to be carried out are mainly clearing, formation, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in the Table 30.1 below.

Table 30. 1 Locations of Specific Works along Namasa-Brohani Road

	Specific Works	Location or Distance
1	Clearing	0+000-11+800
2	Formation	0+000-11+800
3	Construction of culverts	0+200,0+800,0+850,1+200,1+550,1+800,2+000,2+300,3+200,4+000,4+200,5+700,5+900,6+200,6+400,7+100,7+400,7+600,9+300,9+400,10+200,10+800,11+500
4	Filling and gravelling	50m on both sides of each culvert approach

Clearing involves weeding or light bush removal along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction, formation works which include blading and drains. One type of new 'U' shaped culverts will be constructed, Twenty two (22) in number along the road. The sizes of the culverts will be 900x700

Filling will be done mainly in the approaches of culverts and also of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

a. 1No.Bulldozer;
b. 1No. Motor Grader; and
c. 1No. Concrete mixer.

The type of raw materials and the estimated quantities will include:

a. Portland cement (30.8m^3);
b. Fine aggregates (73.90m^3);
c. Coarse aggregates (103.04 m^3);

d. Gravel (87,840m^3); and
e. Filling Material (994m^3).

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty (20) to thirty (30) for the project. The project implementation will take about six (6) months.

30.3 Potential Impacts, Mitigation and Monitoring Measures

The Namasa-Brohani road has not benefitted from any rehabilitation works since its creation. The current proposed minor rehabilitation project will be the beginning of a regular maintenance works to be done on this road. This rehabilitation works will improve and maintain access in the Namasa and Brohani communities in particular, and the Tain District in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 2.5m will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of light bush within the RoW, construction of 22 (900x700) 'U' shaped culverts along the drainage channels.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Noise and vibration impacts;
2. Dust generation and impact on air quality;
3. Occupational/public health and safety hazards;
4. Spread of HIV/AIDS and STIs;
5. Waste generation;
6. Road diversion; and
7. Temporary site office impacts.

30.3.1 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 11.8 km stretch;

- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt by the workers and Namasa and Brohani communities and the school in Brohani at chainage 11+800.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from schools to reduce their impacts. Construction works close to schools would be carried out after close of school. Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

30.3.2 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along portions of the road that pass through communities to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

30.3.3 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

30.3.4 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

30.3.5 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;

- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

30.3.6 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Effective traffic flow and vehicular and worker safety will be monitored daily. Appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants will also be monitored. Accidents and near misses will be recorded and reported to the contractor and the DE on daily basis for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

30.3.7 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 6 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

31.0 JINIJINI-NIFAKWAN ROAD SPOT IMPROVEMENT WORKS

31.1 Project Environment Information

The project road is located in the Berekum Municipality, about 10.0km from Berekum, the municipal capital. The length of the road is 9.7km with the following communities along the stretch: Jinijini, Oscarkrom, Kwamebiakrom, Baahsiri and Nifakwan.

There are farms which are about 10m away along the road corridor (1+050-1+200, 5+300-5+450,6+000-6+750). The vegetation type is light bush. The area is generally noted for agriculture (crop cultivation). The area has four (4) drainage channels and the road is crossed by the Jinijini, Baasiri and Aduaba rivers. The topography is generally undulating.

31.2 Project Description

The current state of the road is poor. There was some maintenance works in the year 2000 on that road. The width of the road is reduced to 3.0m on the average (instead of 6.0m). There are stream crossings which make vehicular passage difficult during the rainy season.

The objective of the proposed spot improvement works include improving access to farming areas, schools, markets, health centres as well as interconnection between communities.

The specific works intended to be carried out are mainly clearing, formation, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table 31.1 below.

Table 31. 1 Locations of Specific Works along Jinijini-Nifakwan Road

	Specific Works	Location or Distance
1	Clearing	0+000-9+700
2	Formation	0+000-9+700
3	Construction of culverts	0+000,0+800,3+200,5+100,6+000,7+400,8+200,
4	Filling and gravelling	0+500-0+700,1+400-2+100,4+200-4+400 and 50m on both sides of each culvert approach

Clearing involves weeding or light bush removal along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction. Formation workswhaich include blading and drains. Two (2) types of new 'U' shaped culverts will be constructed, Eight (8) in number along the road. The sizes and numbers are as follows:

a. 4 No. 900x700;
b. 4 No. 1200x900;

Filling will be done mainly in the approaches of culverts and also low-lying areas of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

a. 1No.Bulldozer;
b. 1No. Motor Grader; and
c. 1No. Concrete mixer.

The type of raw materials and the estimated quantities will include:

a) Portland cement (14.4m^3);
b) Fine aggregates (30.7m^3);

c) Coarse aggregates (45.5m^3);
d) Gravel (8,640m^3); and
e) Filling Material (6,116m^3).

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. It is estimated to employ a workforce of twenty (20) to thirty (30) for the project. The project implementation will take about six (6) months.

31.3 Potential Impacts, Mitigation and Monitoring Measures

Routine maintenance works were carried out on the Jinijini-Nifakwanroad in 2000. The current proposed spot improvement project is part of regular on-going road works to improve and maintain access in the Jinijini and Nifakwan communities in particular, and the Berekum Municipality in general.

The right of way (RoW) already exists. The effective width of the road which has to a large extent reduced to about 3.0m will be restored to its original 6.0m width. The proposed road works will mainly involve clearing of light bush within the RoW, construction of 4 (900x700) and 4 (1200x900) 'U' shaped culverts along the drainage channels and at the Jinijini, Baasiri and Aduaba river crossings.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.**).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational/public health and safety hazards;
5. Spread of HIV/AIDS and STIs;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

31.3.1 Impacts on Water Resources, Mitigation and Monitoring

The road crosses the Jinijini, Baasiri and Aduaba Rivers. These are important water bodies to communities and farmers whose farms are close to them and use them as their main water supply sources.

The construction of a culvert across the Jinijini, Baasiri and Aduaba rivers will entail clearing of vegetation, excavation, and blocking of water flow. Excavated materials may escape into water courses and silt up the waterbed as well as affect water quality. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size, improved channelling and pitching to direct and contain the Jinijini, Baasiri and Aduaba, to prevent overflow or erosion of the adjoining roads, thereby avoiding siltation of the water bodies. Drains will direct storm-water and run-offs.Clearing of grass along the road corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered with tarpaulin.

Excavated materials will be retained away from the river and covered to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the Jinijini, Baasiri and Aduaba rivers:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

31.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Noise and vibration would be generated from the following sources and activities:

- Bulldozer and grader in clearing the 9.7km stretch;
- Excavators for digging trenches for culvert construction;
- Concrete mixers in mixing concrete for culvert construction; and
- Compactors during filling and compaction of the road surface.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. The effects will be felt by the workers and Jinijini, Oscarkrom, Kwamebiakrom, Baahsiri and Nifakwan communities.

Impact of noise will be localised at the operational sites on workers. Noise protection devices such as ear muffs and plugs will be provided to all workers. The use of the protection device by workers will be mandatory at all work sites. The Site Engineer will be accountable for any instance of non-compliance.

Workers exposed to loud noise and vibration by working with noisy and vibrating machines such as concrete mixer and vibratory or static rollerrespectively will not be allowed to work for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and available for inspection to ensure optimal noise generation. The static machines will be sited at least 100m away from homes to reduce their impacts. Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance. Idle equipment will immediately be shut down.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

31.3.3 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Feeder roads are usually associated with dust generation since most of them are untarred. Dust generation is expected to increase during the rehabilitation works. Land clearing, haulage of materials by trucks, excavation, filling and compaction are all dust generating activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Impact of dust and emissions on local communities will however, not be severe since they are not close to the project site.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along portions of the road that pass through communities to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

31.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

31.3.5 Potential Spread of HIV/AIDS and STIs, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 people from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

31.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;

- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

31.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

31.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 6 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

ROAD IN VOLTA REGION

32.0 AHAMANSU - DIKA MINOR REHABILITATION PROJECT

32.1 Project Environment Information

The project road is located in the Kadjebi District, about 40km from Kadjebi, the district capital. The road is 3.50km long and 1m wide with the following communities along the road: Ahamansu, Mangoase, Dika. There are schools, farms and a mosque along the stretch of road.

The vegetation type is savannah bush. The area is generally noted for agriculture: cultivation of cassava and cash crops such as maize, tomato, yams etc. The topography is undulating.

32.2 Project Description

The current state of the road is very poor and has lost its formation and gravels and unmotorable. There has been no rehabilitation works on the road. It is earth surface with low lying sections in water plains.

The objective of the proposed rehabilitation work is to link Ahamansu to Dika as well as interconnection with other communities, and to reduce post harvest losses. The road also provides access to Ampeyo, Todome and Pillar 83.

The specific works intended to be carried out are mainly clearing, formation, construction of culverts and filling and sectional gravelling to 100m thickness. The specific works (according to mileage (location) and/or distance) are provided in Table 32 below.

Table 32. 1 Locations of Specific Works along Ahamansu-Dika Road

	Specific Works	Location/Distance
1	Clearing	Km 0+700 – 5+700
2	Formation	Km 0+000 – 5+700
3	Construction of culverts	0+000, 0+700, 0+800, 0+950, 2+100, 2+225, 2+325, 2+650, 2+850, 3+250, 5+610(B/S)
4	Filling and gravelling	Km 0+000 – 5+700

Clearing involves weeding of savannah vegetation along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culverts construction. Formation works includes blading and drains. 700x900 and 900x1200 types of new culverts will be constructed, 12 in number along the road. The sizes and numbers are as follows:

a) 10 No. 700x900; and
b) 2 No. 900x1200.

Filling will be done mainly in the approaches of culverts and also 1.0km of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

a) 1 No. Bulldozer D7 or equivalent;
b) 1 No. Motor Grader 140G or equivalent;
c) 1 No. Loader (1m^3);
d) 2 No. Tipper trucks (6m^3);
e) 1 No. Water tanker (9000litres);
f) 1 No. Vibratory or Static roller (10 tonnes);
g) 1 No. Pick-up;
h) 1 No. Concrete mixer (0.5m^3); and
i) 1 No. Poker vibrator.

The type of raw materials and the estimated quantities will include:

a) Portland cement (845bags);
b) Gravel (13,864m^3);
c) Fine aggregates (36,897m^3);
d) Coarse aggregates (79,866m^3); and
e) Reinforcement rods (4.42 tonnes).

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. The minor rehabilitation work is expected to employ a workforce of thirteen (13) and implementation will take about 12 months.

32.3 Potential Impacts, Mitigation and Monitoring

There has been no rehabilitation works on the road recently. The current proposed rehabilitation works for the 3.50km stretch form part of regular road works to enhance access to Ahamansu, Mangoase, Dika, Ampeyo, Todome and Pillar 83 communities. The right of way (RoW) already exist.

The specific works intended to be carried out are mainly savannah clearing, formation, construction of culverts and filling and sectional re-gravelling.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc.
With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. This will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade**.).** Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members**.**

There will be few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. The potential impacts, mitigation and monitoring of the following are presented below:

1. Water resources impacts;
2. Noise and vibration impacts;
3. Dust generation and air quality impacts;
4. Occupational/public health and safety;
5. HIV/AIDs impacts;
6. Waste generation;
7. Road diversion; and
8. Temporary site office impacts.

32.3.1 Impacts on Water Resources, Mitigation and Monitoring

The minor rehabilitation specific works such as savannah clearing, formation, construction of culverts and filling and sectional re-gravelling of the 3.50km road may result in the pollution of the many creeks (10) in the area resulting in deteriorating the water quality and modifications in the flow regimes especially during the rainy season.

Since some of the project road lies in water plains and the topography is undulating, flow may be increased resulting in flooding, ponding, soil erosion, channel modification and siltation of the creeks especially during the rainy seasons. Other sources of water pollution may include sedimentation, changes in biological activity in the stream and on their banks, chemicals (cement/concrete) spillage, and contaminated run off from petroleum product seepage, exhaust emissions and corrosion of reinforcement rods among others.

Savannah vegetation clearing, blading and gravelling will be restricted to the right of way. Heaps of sand and gravel from excavation will not be kept less than 15m to the banks of the creeks. There will be 12 culverts and drainage channels along the road corridor to direct run offs.

Fuels and other sources of raw materials such as cements and iron rods will be stored at designated places at Site Office (SO) at Ahamansu away from steep slopes and the creeks to prevent pollution from run offs. The bulldozer, vibratory/static roller, tipper trucks, motor loader and grader to be used for the rehabilitation works will be serviced regularly (two months interval) for better engine performance to prevent fuel leakages into the water bodies.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the creeks:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

32.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

Movement of the bulldozer, vibratory/static roller, tipper trucks, motor loader and grader on the 3.50km stretch of road during the rehabilitation activities will increase ambient noise levels and vibration far beyond the immediate road corridor to the Ahamansu, Mangoase, Dika nearby communities. These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of this excessive noise and vibration will include human welfare and physiological disruption, hearing impairment and communication problems. These may cause elevated stress levels and associated behavioural and health problems for people in the nearby communities and the workers. They can also cause auditory fatigue, sleep disorders, and even contribute to learning problems in children.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the

machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from mosques and schools to reduce their impacts. Construction works close to schools would be carried out after close of school while. Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

32.3.3 Dust Generation and Air Quality Impact, Mitigation and Monitoring

The rehabilitation works on the 3.50km stretch of the feeder roads construction will cause air pollution which could adversely affect the people engaged directly or indirectly in road sector activities. Generation of dust will also occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site. This could be one of the major issues for Ahamansu, Mangoase, Dika communities and the workers if work is carried out during the dry season which is usually the case. Air pollution effects are going to be mainly due to the particulates from vehicular emissions of the bulldozer, vibratory/static roller, tipper trucks, motor loader and grader. Other sources are silica in dust during gravelling and from the earth agitated by constructional equipment and vehicles plying on the 3.50km uncompleted and untarred roads and other raw materials such as the 845 bags of cements to be used. The resultant effects are acute/chronic respiratory disorders, lung and heart diseases etc. Acute manifestations of its effects include inflammatory conditions like bronchitis, bronchiolitis and pneumonia which may be rapidly fatal.

During the 12 months of the 3.50km road rehabilitation works, there will be twice daily (at least once daily) water dousing to minimize dust. Contract specifications will also clearly include dust control measures.

The tipper trucks (hauling trucks) will be covered with tarpaulin to avoid dust emissions. Raw materials will also be sourced and stored away from Ahamansu, Mangoase, Dika communities and all the 13 workers will be provided with nose masks against dust.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

32.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercises.

32.3.5 HIV/AIDs Impacts, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the condition for engaging multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with

the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 2 people from the workforce while the nearby communities nominate 2 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

32.3.6 Potential Waste Generation, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

32.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of the culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers who will be operating close to moving vehicles could be at the risk of knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

32.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration of 12 months for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

33.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN IMPLEMENTATION

The plan for implementation of enhancement and mitigation measures and monitoring activities in the ESMP is presented in this chapter. The plan highlights the relevant institutional roles/responsibilities for monitoring and reporting on the environmental and social safeguards performance and results, as well as a proposed capacity building provision to facilitate the ESMPs implementation. Cost estimates for implementation of the various measures, monitoring plan and capacity building are also given. The implementation budget will enable financing for the ESMPs to be an integral part of financing for the rehabilitation/maintenance projects.

33.1 Implementation Stages, Safeguard Measures and Institutions

The general outline of the ESMP implementation by the various actors will involve the following stages:

- ESMP preparation and approval;
- Contract specifications on E&S safeguards obligations;
- Rehabilitation/project contract award;
- E&S safeguards implementation plan and schedule;
- Rehabilitation/project commencement;
- Capacity building on E&S safeguards (and other awareness programme);
- E&S safeguards and mitigation implementation;
- Monitoring of safeguard/mitigation measures;
- Reporting; and
- Compliance and other periodic verification monitoring.

The main environmental and social safeguard measures in the ESMPs cover the following:

- Water resources, erosion control and flood prevention management;
- Noise and vibration exposure management;
- Dust control management;
- Public and occupational health and safety management;
- HIV/AIDS and health awareness management;
- Waste management; and
- Road diversion and accident prevention.

The key actors in the implementation of the ESMPs include:

- The contractor- to be awarded the rehabilitation contract and be required to implement the environmental and social safeguard measures;
- DFR - to ensure that E&S safeguards and other mitigation measures are duly implemented;
- EPA - to ensure compliance with the ESMP and other relevant approval conditions;
- MRH - to oversee the effective implementation of the road works and related E&S safeguards;
- MEST - to address complaints of any aggrieved parties on E&S safeguards, especially with respect to any ‘unfavourable’ decision (action or inaction) by the EPA.

The other components of the ESMPs include capacity building for the relevant actors and a proposed budget to facilitate implementation. The specific E&S safeguard obligations of the contractor that can be incorporated into the contract specifications are provided in Appendix 2. This is in addition to other contractual provisions made in the General Items of the Bills of Quantities, such as the following:

- Reinstatement of borrow pits (Item no. E790.1);

- Safe drinking water for site employees including storage facilities (Item no. A420.1);
- Protective clothing, safety equipment for use by site employees (Item no. A420.2);
- Temporary latrines, relocate as necessary, remove and backfill on completion (Item no. A420.3);
- Assistance to and facilitate site visits by MoH personnel to educate workers and local communities in STDs, HIV/AIDS awareness and consultation meetings (Item no. A420.5).

33.2 Institutional Roles

The key actors in the implementation of the ESMPs whose specific roles are listed below are DFR, EPA, MRH and MEST, as well as the contractor.

33.2.1 Department of Feeder Roads

The DFR is responsible for ensuring that all the environmental and social safeguards associated with the projects are implemented. The system for addressing E&S safeguards comprise of DFR District Engineers, Environmental Desks at Head office and Regional offices and the Planning and Policy Unit. The National Environmental Desk (NED) facilitates preparation of the ESMPs and ascertains the quality for necessary approvals; takes custody of the final ESMPs and makes copies available to the Regional and District offices. The NED also plays a lead role in E&S safeguards capacity building at Regional and District offices as well as for contractors.

33.2.2 District Engineer (DE)

The DEs are the first line of contact with the contractors awarded the rehabilitation works and for implementing the project E&S safeguards. The DEs:

- Have custody of copies of ESMPs;
- Obtains contractors work plan and E&S implementation schedule;
- Adopts a monitoring plan and schedule;
- Conducts bi-weekly site inspection and monitor implementation of E&S safeguards;
- Receives and reviews reports from the contractor;
- Prepares and submits monthly and subsequent quarterly and annual reports to the Regional Environmental Desk.

33.2.3 Regional Environmental Desks (RED)

The RED serves as a link between the District DFR offices and the NED and provides back stopping on safeguard issues for DEs. The RED:

- Conducts bi-monthly monitoring on implementation of project E&S safeguards;
- Receives and reviews reports from the districts;
- Collates performance on the implementation of E&S safeguards in the district; and
- Submits monthly and subsequent quarterly and annual reports to the NED.

33.2.4 National Environmental Desk

The NED:

- Notifies EPA on commencement of the rehabilitation works/project;
- Reviews and collates reports from the REDs;
- Collates quarterly reports on E&S safeguards performance for the attention of Director (DFR) and submission to EPA head office;
- Shares lessons/recommendations with the Policy and Planning Unit (DFR), in order to incorporate E&S safeguards adaptive management in road project designs; and

- Submits quarterly and annual reports to the Ministry of Roads and Highways.

33.2.5 Environmental Protection Agency

EPA is the lead regulator on E&S safeguards and has the mandate to determine the form an ESMP should take. Other specific roles include:

- Review and verify ESMPs in order to grant environmental approval for the ESMPs (with accompanying schedule of conditions);
- Receive quarterly monitoring reports (EPA Head office) from DFR;
- Act on the DFR quarterly monitoring reports (Regional EPA office);
- Conduct quarterly compliance monitoring (Regional offices);
- Submit quarterly monitoring (compliance) reports to EPA Head Office;
- Collate and submit sector (feeder roads) annual report to Head office; and
- Include the sector E&S performance in the overall EPA annual report.

33.2.6 Ministry of Roads and Highways

MRH is the supervising ministry for the DFR and the other road sector agencies. It is responsible for road sector policy formulation. The Ministry:

- Receives quarterly reports on the E&S safeguards from DFR during the project works as well as post-rehabilitation lifecycle of the road; and
- Conducts various impromptu and one annual end of year monitoring of the project sites.

33.2.7 Ministry of Environment, Science and Technology (MEST)

MEST is responsible for policy formulation relating to the environment. In respect of the ESMPs, the Ministry may carry out grievance redress or act on complaints by DFR on decisions or actions by the EPA to which DFR may not be in agreement.

33.2.8 Contractor

The E&S safeguards will be included in the contract specification and costed as appropriate, in order that there will be budget to implement the safeguards and other mitigation measures. The contractor will be required to:

- Develop a plan of work which incorporates schedule for E&S safeguards implementation;
- Submit the plan of work and schedule of E&S safeguard implementation to the DE;
- Implement all E&S safeguards and other mitigation measures as planned;
- Train/create awareness of all personnel/workers on relevant E&S safeguard measures and on their obligations; and
- Submit implementation reports on E&S safeguards to DE.

33.3 Institutional Arrangements

The implementation of this ESMP requires the collaboration and involvement of the key institutions. The Figure 33.1 below illustrates the institutional roles and arrangement in the implementation of the ESMPs.

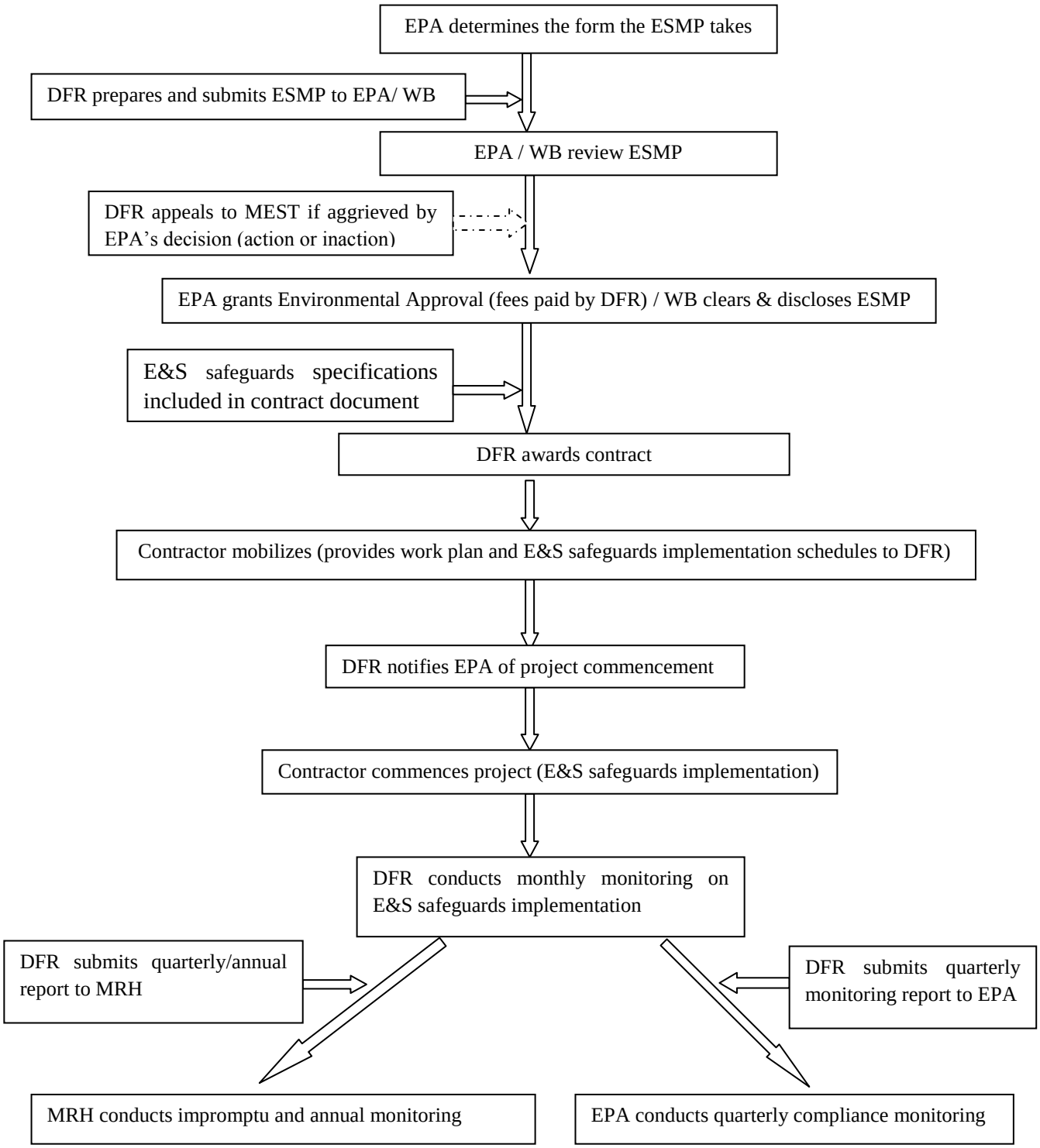

Figure 33. 1 Institutional Arrangement Flow Chart

33.4 The Environmental and Social Management Measures

The environmental and social management measures presented below will be implemented or adhered to by the Contractor (Site Engineer), and will also serve as the basis for monitoring.

33.4.1 Water Resources, Erosion Control and Flood Prevention Management

Management measures for affected water resources, erosion control and flood prevention include:

- Location (heaping) of construction material (e.g. sand and other aggregates) not less than 50m from water bodies and drainage channels (i.e. a separation distance of 50m will be observed);
- Site for fuelling of machinery and servicing of equipment will be located at a minimum distance of 100m from water bodies, wetlands and drainage channels;
- Embankment erection around fuelling and other liquid or spillable storage sites in order to limit or contain such material from escape to potentially pollute water resources;
- Side drains (where appropriate) will be provided with settling basins near water bodies to remove silt and debris from road surface and construction site run-off, before discharge to adjoining streams or rivers;
- Adequate side drains provided to carry run-off into drainage channels to prevent erosion;
- Culverts of suitable capacity constructed to contain and direct flow, especially at peak flow and run-off;
- Road maintenance works to be carried out off peak rainy season;
- Provision of toilets and urinal at locations not less than 50m away from water bodies; and
- Adequate worker awareness on sanitation and measures to avoid water resource contamination.

33.4.2 Noise and Vibration Exposure Management

Use of machinery in clearing vegetation, earth (soil) movement and other concrete works such as culvert construction and movement of trucks will be the main sources of noise and vibration. The following management measures will be implemented:

- Equipment servicing plan will be prepared and strictly followed to ensure efficient machinery performance and optimum noise generation;
- Stationary equipment shall be sited at safe distances from sensitive areas to minimise noise impacts;
- Workers operating noisy equipment will not be exposed continuously for more than 3 hours a day;
- Workers will be provided with ear plugs;
- Workers handling vibrating equipment or parts will be given pads to absorb the vibrations and will not be exposed continuously for longer than 3 hours a day; and
- Sanctions (ranging from a fine to dismissal) will be instituted by the Contractor against workers who do not observe the use of appropriate PPEs.

33.4.3 Dust Management

Dust generation will be controlled mainly by the use of water, especially in the dry season. The contractor will acquire a water tanker for purposes of water dousing to control dust emission. Others measures will include:

- Erection of speed control signals and ramps mounted in communities;
- Covering of hauling trucks carrying sand and other aggregates;
- Covering of heaped material e.g. sand will be covered: and
- Use of nose masks by all workers at road maintenance/works sites.

Surfaces of vegetation along the maintenance road will be monitored to verify the effectiveness of dust suppression method.

33.4.4 Public and Occupational Health and Safety Management

Public occupational health and safety management will include:

- Erection of warning signals and use of reflective tapes at approaches to excavations, heaped materials, stationary equipment, etc.
- Posting of speed limits of 50km/h at approaches to construction sites;
- Tool box (safety) meetings held twice a week and documented accordingly;
- Inductions and awareness programmes held for all employees on occupational health and safety practices;
- A First Aid team formed to provide first aid services to workers and where appropriate make referrals to the District Health Centre;
- First Aid team to be trained by a medical team from the District Health Centre;
- Accident records at construction site and neighbourhoods to be maintained both for workers and the public;
- Stocks of PPEs to be maintained and supplied to workers regularly as needed; and
- Workers required to wear the appropriate PPEs e.g. helmets, ear plugs, nose masks, vibration pads, hand gloves, etc.

33.4.5 HIV/AIDS and Health Management

The work place HIV/AIDS and general health maintenance plan will include the following:

- Quarterly HIV/AIDS awareness programmes for workers and nearby communities;
- Health and HIV awareness team arranged from the District Health Centre for the quarterly programmes;
- Sponsored educational package put together by the team to be implemented to enlighten both workers and communities;
- Training of peer educators within the work force and in communities by the team; and
- The company to provide free condom supplies and encourage free discussions, counselling and testing.

33.4.6 Waste Management

The following waste management measures will be implemented:

- Waste bins to be provided for the disposal of waste generated;
- Waste will be segregated into two at source - organic and plastic and glass wastes;
- Organic waste to be composted near the site office to enrich the soil, while plastics and glass are taken to the district dump-sites;
- Topsoil removed from the right of way for maintenance work to be spread on the land to avoid disrupting drainage network; and
- Toilets and urinals to be sited at least 100m from any stream or drainage channel and decommissioned at the end of project.

33.4.7 Road Diversion and Accident Prevention

Closing one lane of the road while keeping the other open during construction of culverts would expose workers and the general public to imminent accident risks. The following management measures will be taken:

- A temporary structure to be constructed on one lane to allow for traffic flow while work is on-going on the other lane;
- Traffic wardens to be posted at positions 100m from the construction points on either side of the road to ensure orderly movement of traffic;
- Actual working areas to be secured with barricades;
- Adequate road warning signs to be posted at vantage points to warn and direct traffic;
- All measures to be monitored by Contractor to ensure effective implementation.

33.4.8 Temporary office site reinstatement

The plan will require:

- Identification of site with no farmlands with crops or physical assets;
- Seeking the consent of the landowner for site office erection; and
- Reinstatement of the site and agreement to handover the structure to landowner.

Table 33. 1 Summary of Environmental Management Plan

Management Area	**Impact Areas**	**Mitigation/Monitoring Actions & Requirements**	**Implementation & Reporting Schedule**	**Responsibility**
Dust and Air Quality Management	• Dust generation due to construction activities	➢ Dousing with water ➢ Erection of speed control signals and ramps ➢ Covering of sand (both heaped and in haulage trucks) ➢ Inspection of surfaces of vegetation	Twice daily Continuous Daily Monthly	**Contractor/ SE** **DE**
Water Resources, Erosion Control and Flood Prevention Management	• Siltation of water bodies resulting from excavation works and material deposition • Contamination of water by oil from vehicle	➢ Completing work on schedule ➢ Deposition of construction materials at least 50m from water bodies ➢ Embankment erection around fuelling and servicing area for vehicles ➢ Awareness creation	Continuous Continuous Continuous Continuous	**Contractor/ SE**
Noise and Vibration Exposure Management	• Noise from machine clearing of vegetation • Culvert excavation, construction and other maintenance works • Concrete mixing machines	➢ Controlling exposure of workers to noisy and vibrating equipments ➢ Regulating distance of stationary noisy equipment from public places	Daily Daily	**Contractor/ SE**
Occupational Health and Safety	• Accidents resulting in injury • Noise from machinery	➢ Tool box (safety) meetings will be held twice a week ➢ Awareness creation ➢ Training of first aid team ➢ Maintenance of accident book ➢ Provision and use of PPE	Bi-weekly Monthly Quarterly Weekly Daily	**Contractor/ SE**
HIV/AIDS and STIs Management	• Spread of infection due to neglectful sexual attitudes	➢ HIV/AIDS and STIs Awareness workshops ➢ Provision of free condoms ➢ Peer group education	Quarterly Weekly Twice monthly	**Contractor/ SE**
Waste Management	• Indiscriminate waste dumping and defecation	➢ Segregation of waste ➢ Composting of organic waste ➢ Emptying of waste bins at waste dump sites provided by the District Assembly ➢ Decommissioning of toilets after project	Daily Weekly Daily	**Contractor/ SE**
Road diversion and accident prevention	• Risk of accidents to workers and general public	➢ Posting of traffic wardens to direct traffic flow ➢ Mounting of road signs ➢ Protecting actual working area with barricade ➢ Monitoring the implementation of all management measures	Daily Daily Daily	**Contractor/ SE**

Office site reinstatement	• Effect on crops and physical assets	➢ Avoiding crops and physical assets ➢ Seeking landowner's consents ➢ Reinstating site and agreeing to hand over structure	Project commencement Project commencement Project completion	**Contactor/DE**

33.5 Capacity Building

Capacity building in environmental and social impact management will be essential. Personnel at the forefront of the various road rehabilitation projects need to understand the purpose of the ESMP implementation and their expected roles. This will stimulate the required collaboration.

The target groups for the training will include:

- DFR District Engineers;
- Contractors;
- Construction workers; and
- Selected members from the nearby communities.

The district engineers and contractors will require capacity building in the implementation of the projects' environmental and social safeguards and general project planning and management inter-faced with E&S components. Capacity requirements are also in the areas of environmental and social management and reporting as well as monitoring of adherence to required environmental and social principles, standards and commitments. The construction workers and selected members of the project communities will undergo training on public awareness creation/educational techniques (on environmental, social and health issues) and first aid procedures.

33.6 ESMPs Implementation Budget

The cost estimates provided in the Table 33.2 is for the implementation of mitigation measures, monitoring plan and capacity building requirements.

Table 33. 2 Proposed Budget for the ESMPI

No.	E&S Management Area/ Institution	Mitigation Measures/ Capacity Gaps Identified	Expected Outcome/ Capacity Building Measures	Rate	Estimated Cost ($)
1.	Water resources, erosion control and flood prevention	• Construction of embankments • Construction of side drains with settling basins	• Limitation and containment of spilled fuel & oil at the sites • Reduction of siltation in nearby water bodies	• $1000 per road • $2000 per road	29,000 58,000
Sub-Total					**87,000**
2.	Dust and air quality	• Water dousing & overing of sand (heaped and during transportation) • Erection of road signals and ramps	• Reduction in dust generation • Vehicular speed reduction leading to lowering dust generation	• $5000 per road • $2000 per road	145,000 58,000
Sub-Total					**203,000**
3.	Public and occupational health and safety	• Provision of additional PPEs (nose masks, gloves, ear plugs etc.) for workers • Training for First Aid	• Reduction in the exposure of workers to hazardous conditions • Quick & effective response	• $2000 per road • $1000 per	58,000 $29,000

		teams (materials, etc) • Waste collection, segregation & disposal	to accidents • Preventing waste litering & pollution	road • $2000 per site office	58,000
Sub-Total					**145,000**
4.	HIV/AIDS	• Awareness campaigns • Distribution of condoms • Training of peer group educators	• Reduction in the spread of HIV	• $2000 per road	58,000
Sub-Total					**58,000**
5.	Department of Feeder Roads (DFR)	• Capacity enhancement in environmental and social safeguard principles implementation	• Training in environmental and social management for DEs (2 days for 29 persons)	• $ 100/p/d	2,900
6.	Contractors	• Capacity building of staff in environmental & social management implementation	• Training in environmental and social management implementation for the 29 contractors. (1 SEs each) (2 days for 29 persons)	• $ 40/p/d	2,320
7.	Training Consultants		Training of DEs & SEs for a total of 4 days (by 4 Consultants including T&T, accommodation & meals)	• $1,000/p/d	16,000
	Sub-Total				**21,220**
TOTAL					**514,220**

34.0 PUBLIC CONSULTATIONS

Consultations were held with Department of Feeder Roads (DFR), District Health Directorates (DHDs) and District Offices of the Ministry of Food and Agriculture (MoFA). The stakeholders' views were sampled on the importance of the selected roads to effective health delivery and food production and transportation.

DFR was also consulted on the environmental and social safeguard monitoring, reporting and capacity buildings in fulfilling these mandates.

Table 34. 1 Consultations with DFR, West Mamprusi District Date: 16th December 2010

	Name of Respondent(s)	**Designation**	**Contacts**
	Mr Francis Nkunu	District Engineer	02081663351

Capacity Building		
1	How limiting and/or available is the capacity in the District Office to perform environmental monitoring and reporting?	- *Capacity available, but extra capacity building will be welcomed* - *Currently District Engineer advises and checks Contractors on Environmental Compliance*
2	Is there any relationship between the district and the headquarters to monitor environmental and social safeguard issues?	- *Yes, the Head Office at the Regional level has oversight responsibility and they report to the National Headquarters*
3	What capacity needs would have to be built and what estimated budget would be required?	- *Giving extra attention to environmental and social compliance issues*

Figure 34. 1 Consultations with the Department of Feeder Roads, West Mamprusi District

Table 34. 2 Consultations with MoFA -West Mamprusi District Date: 16th December 2010

	Name of Respondent(s)	Designation	Contacts
1	Mr. Leonard Yosangfo	District Director	0244434051/0382093705

Importance of Road to Agriculture		
1	What is the use of the road in terms of agriculture?	- *It connects the area which is an important maize, rice and other cereal production areas*
2	Is the current state of the road good enough for the promotion of agriculture in the area?	- *No, the roads are very bad and becomes impassable during the rainy season*
3	What other agriculture related problems are associated with the current state of the road?	*It hampers extension services hence affecting the value chain process*
Benefits of the Road Rehabilitation to Agriculture		
1	What will be the immediate benefits of the rehabilitation of the road to agriculture?	- *It will open up the place for the transportation of harvested cereals/maize and vegetables to market centres and reduce post harvest losses*
2	What other benefits will it bring to the District MOFA?	- *It will facilitate the agricultural extension services by the officers of the ministry* - *It will promote the value chain process*

Figure 34. 2 Consultations with MOFA, West Mamprusi District

Table 34. 3 Consultations with DHD of West-Mamprusi Date: 16th December 2010

	Name of Respondent(s)	Designation	Contacts
1	Dr John Abenyeri	District Director of Health Services (DDHS)	0244730198
2	Mr. Agunga Bruno	District Nutrition Officer (DNO)	0246531448
3	Mrs Margaret Awukume	DPHN	0244457669
4	Mr Stephen Dadia	DCO	0242541727

Disease Prevalence		
1	What are the predominant diseases in the district?	- *Malaria, Diarrhoea, CSM, Respiratory Track Infection (RTI), etc*
2	How does the road contribute to health delivery?	- *Used by health workers for immunization and educational programmes* - *For National Health Insurance Service (NHIS) registration*
Importance of the Road Rehabilitation to Health Delivery		
1	What are the benefits of the road rehabilitation to health delivery?	- *To facilitate health delivery* - *Enhance NHIS registration which is currently low due to access problems* - *Will open up the area on more follow ups on immunization programmes*

Figure 34. 3 Consultations with the District Directorate of Health Services, West Mamprusi District

Table 34. 4 Consultations with DFR, Kintampo North Municipality Date:15th December 2010

	Name of Respondent(s)	**Designation**	**Contacts**
	Agyei-Kodom Kwebena	Assistant Area Engineer	0543372316

No	**Issues**	**Responses**
1	How limiting and/or available is the capacity in the District Office to perform environmental monitoring and reporting?	*Capacity available among the District Engineer Currently District Engineer advises and checks Contractors on Environmental Compliance*
2	Is there any relationship between the district and the headquarters to monitor environmental and social safeguard issues?	*Yes, the district ensures that all tenders include adequate measures on environmental compliance and reported to the Regional officer and headquarters.*
3	What capacity needs would have to be built and what estimated budget would be required?	*Additional in-house capacity for the District Engineer is welcome. Koforidua Centre for the Department should be consulted for information on budget..*

Figure 34. 4 Consultation with the Department of Feeder roads, Kintampo North Municipal

Table 34. 5 Consultations with MoFA, Kintampo North Assembly Date: 15th December 2010

	Respondents	Designation	Contacts
1	Boffah Owusu Akyeaw	District Development officer in Charge of Crops	0249865849/ 0200862751
2	Paul Ayekonolo	District Development officer in Charge of Livestock	0208543617/ 0248085706
3	Joseph Yelibora	MDO-Extension	0242264710

Importance of Road to Agriculture		
1	What is the use of the road in terms of agriculture?	*It serves an important route to transport for food crops like yam, cassava, maize and Cowpea*
2	Does the current state good enough for the promotion of agriculture in the area?	*No, the road is so bad that it makes it hard for extension Services workers do effective work. Also farmers are not encouraged to produce crops in quantities for fear of crop spoilage especially the yams and cassava. Truckers and head load are the only means of transportation.*
3	What other agriculture related problems are associated with the current state of the road?	*Farmers who borrow money for crop production fail to make profits to pay back debts discouraging them from farming activities.*
Benefits of the Road Rehabilitation to Agriculture		
4	What will be the immediate benefits of the rehabilitation of the road to agriculture?	*Ease transportation problems and reduce the cost of stable food crops like maize, yams, cassava, and copeas.*
5	What other benefits will it bring to the District MOFA?	*It will facilitate the agricultural extension services by the officers of the ministry.*

Figure 34. 5 Consultations with District MoFA, Kintampo North Municipal Assembly

Table 34. 6 Consultations with DHD of West-Mamprusi Date: 15th December 2010

	Name of Respondent(s)	Designation	Contacts
1	Mr Simeon Adams	Municipal Disease Control officer	0243289072

Disease Prevalence		
1	What are the predominant diseases in the district?	*Malaria, typhoid, Acute Resp. tract infection, Hypertension, Diarrhea infections, HIV etc.*
2	How does the road contribute to health delivery?	*Used by health workers for immunization and educational programmes and other outreach services. During the just end Measles immunization, some portion of the Weila area could not be covered because of bad roads.*
Importance of the Road Rehabilitation to Health Delivery		
3	What are the benefits of the road rehabilitation to health delivery?	*Will facilitate the establishment of Community Health Posts (CHPs), Smooth transportation of pregnant woman to the centre.*

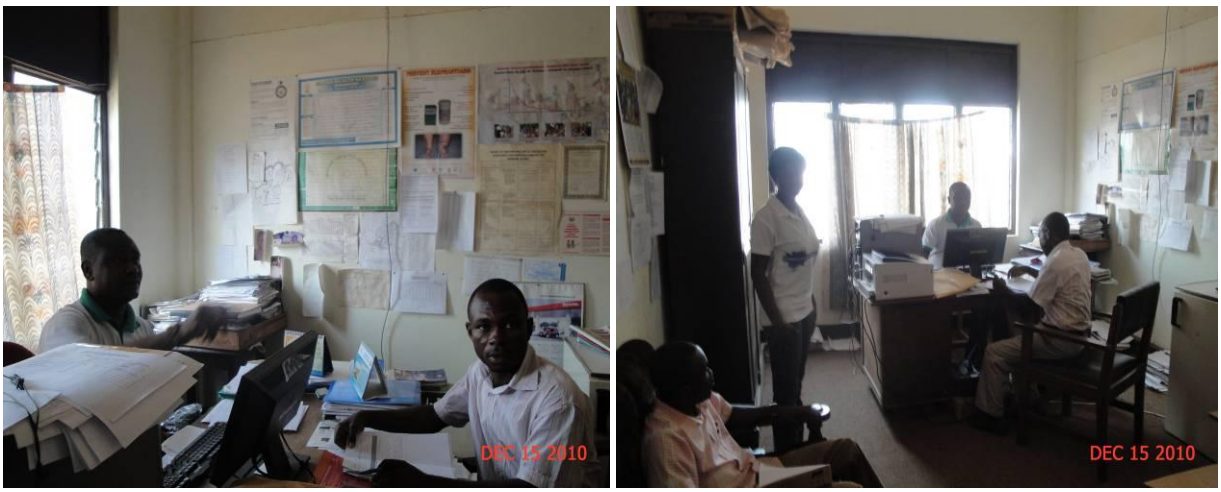

Figure 34. 6 Consultations with the District Directorate of Health Services, Kintampo North Municipal

REFERENCES

- Strategic Environmental Assessment Framework (ESMF) for the Transport Sector Development Programmes by Ministry of Roads and Highways, Ghana, January 2007
- Environmental Protection Agency Act, 1994. Act 490
- Ghana – Environmental Action Plan, Accra 1991
- Ghana Environmental Assessment Regulations, 1999 (LI 1652)
- World Bank Operational Policy 4.12: Involuntary Resettlement, 29 June 1990.
- World Bank Operational Policy 4.01: Environmental Assessment, 30 October 1991.
- World Bank Environmental Assessment Sourcebook, Vol. II, 1991
- http:// www.ghanadistricts.gov.gh. Retrieved 18th June, 2010

APPENDICES

APPENDIX I

Guidelines for Conducting Individual Road Project Assessment

A. Project Description

	Project Features	Responses
1	Name of Project Road	
2	District and distance (of road) to the District Capital	
3	Region	
4	Length of road (and also width of road)	
5	Objectives of the proposed road works	
6	Current state and relevant features of the road that call for the proposed works	
7	History of rehab/maintenance/works (e.g. last time worked on)	
8	Importance (or potential importance) of the road	
9	Communities and areas served by the road	
10	Benefits to be derived from the road works (i.e. improved road)	
11	List the specific works intended to be carried out (according to chainage/mileage –where applicable)	
12	Indicate what each specific work involves	
13	List the types and number of equipment/machinery to be used	
14	Workforce (numbers)	
15	Type of raw materials and sources (e.g. aggregates/gravels, etc) and distance from the project road	
16	Estimated quantities of raw materials	
17	Duration of the road works	
18	Type of waste (substances) to be generated	
19	Work/ site (area) and facilities to be provided	

B. Project Corridor and Adjoining Area (Baseline) Information

	Baseline Features	Responses
1	Number and names of communities located along the road	
2	Other communities and main towns served by the road	
3	Land cover and land use of the area (e.g. vegetation, farming, grazing, reserve, communities/settlements)	
4	Facilities/resources located along the road corridor (e.g. school, clinic, houses, cemeteries, sacred groves, farms) and proximity (how close) to the road	
5	Number of water bodies (rivers, streams, creeks, etc) and drainage channels crossing the road	
6	Names of the water bodies (if known), indication of size and seasonal flow pattern (e.g. extent of flooding)	
7	Elevation and topography of the area – corridor (e.g. flat, hilly, valley, undulating, flood plain)	
8	Existing conditions at potential burrow pit area (vegetation, farms, etc)	
9	Regional baseline information on feeder roads	
10	Any characteristics of feeder roads common or peculiar to the Region	
11	State of feeder roads – statistics	
12	Importance of feeder roads to Districts and the Region	

C. Potential Impacts (Environmental & Social) of the Project (Road Works & Burrow Pits)

1 ***Air Quality*** **-** Will the proposed Project:

i. Emit during construction

Dust □ Smoke □ VOCs □

ii Expose workers or the public to substantial emissions? Yes □ No □

iii. Result in cumulatively increased emissions in the area? Yes □ No □

vi. Create objectionable odour affecting workers/people? Yes □ No □

2 ***Biological Resources*** **-** Will the proposed Project:

i. Have adverse effect on any reserved (Wildlife/Forestry) area? Yes □ No □

ii. Have adverse effect on wetland areas through removal, filling, hydrological interruption or other means? Yes □ No □

iii. Interfere substantially with the movement of any wildlife species or organisms? Yes □ No □

vi. Be located within 100m from an Environmentally Sensitive Area? Yes □ No □

3 ***Cultural Resources*** **-** Will the proposed Project:

i. Disturb any burial grounds or cemeteries? Yes □ No □

ii. Cause substantial adverse effect on any archeological or historic site? Yes □ No □

iii. Affect the existing visual character and sensibilities of communities e.g. through trees and rock removal? Yes □ No □

4 ***Water Quality and Hydrology*** **-** Will the proposed Project:

i. Generate and discharge during the works:

Liquid waste □ Liquid with oily substance □
Liquid with human or animal waste □ Liquid with odour/smell □

ii. Lead to changes in the drainage pattern of the area, resulting in erosion or siltation? Yes □ No □

iii. Lead to increase in surface run-off, which could result in flooding on or off-site? Yes □ No □

iv. Increase runoff, which could exceed the capacity of existing storm water drainage? Yes □ No □

5 ***Noise Nuisance*** **-** Will the proposed Project:

i. Expose workers and other persons to excessive vibration and noise? Yes □ No □

6 ***Farms, Houses and Community Property*** **-** Will the proposed Project affect:

i. Farms? Yes □ No □

ii. How many farms will be affected and at what chainage/mileage?

iii. How much farmland (total area of farms) will be affected?

iv. How many farmers will be involved and from which communities?

v. Houses? Yes □ No □

vi. How many houses and at what chainage/mileage?

vii. In what communities will houses be affected?

viii. How many families will be affected?

ix. Community Property/Facility/Resource? Yes □ No □

x. What community property/facility/resource?

xi. In which communities and at what chainage/mileage?

APPENDIX II

Contract Specifications for Contractor

1.0 General

a. All Environmental and Social (E&S) safeguards associated with the contract shall be complied with by the contractor. The Contractor shall also update himself about such issue in the ESMP, and prepare his work strategy and plan to fully take into account relevant provisions of the ESMP.

b. The Contractor shall develop a plan of work indicating all Environmental and Social safeguards at the various stages and indicate the period within which site will be maintained to it's original state after completion of works to ensure that significant E&S safeguards have been addressed appropriately.

c. The Contractor shall adhere to the proposed plan implementation schedule and the monitoring plan to ensure effective feedback of monitoring information to the DFR district Engineer (DE).

d. The Contractor shall implement all measures to avoid undesirable adverse environmental and social impacts wherever possible, restore work sites to acceptable standards, and abide by all environmental performance requirements specified in the ESMP

2.0 Dust Mitigation Measures

e. The contractor shall minimize the effect of dust on the surrounding environment resulting from site clearing, vibrating equipments and temporary access roads.

f. During the rehabilitation project, the contractor shall carry out proper and efficient measures, such as water dousing, whenever necessary to reduce the dust nuisance, and to prevent dust originating from the operations.

3.0 Noise Due to Construction Activities

g. The contractor shall ensure the noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation) are kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and nearby communities.

4.0 Waste Management

h. Construction waste shall not be left in stockpiles along the road, but removed and disposed of/or reused where needed.

i. All waste shall be segregated into organic waste and plastic and glass. The organic waste will be composted near the work site to enrich the soil while plastics and glass will be taken to the district dump sites

j. All sanitary facilities (e.g. garbage collection and disposal, drinking water facilities, etc.) shall be provided by the contractor in work sites or project sites.

5.0 Water Resource Management

k. No construction water containing spoils or site effluent, especially cement, oil and fuel, shall be allowed to flow into natural water drainage courses.

l. The contractor shall take all possible steps to prevent pollution of streams and other water supplies.

m. Entry of runoff water to the site shall be restricted by constructing diversion channels or culverts to reduce the potential of soil erosion and water pollution.

n. Waste water from washing out of equipment shall not be discharged into water courses.

6.0 Material Excavation and Deposit

o. Vegetation clearing shall be restricted to the area required for safe operation of the rehabilitation work. Vegetation clearing shall not be done more than two weeks in advance of rehabilitation.

7.0 Contractor's Environment and Social Management Plan (ESMP)

p. Within 6 weeks of signing the Contract, the Contractor shall prepare a work plan to ensure the adequate management of E&S aspects of the works, including implementation of the requirements of these general conditions and any specific requirements of an E&S safeguards for the works. The Contractor's work plan will serve two main purposes:

i. For the Contractor, for internal purposes, to ensure that all measures are in place for adequate E&S management, and as an operational manual for his staff.

ii. For the Client, supported where necessary by SE, to ensure that the Contractor is fully prepared for the adequate management of all E&S safeguards issues.

q. The Contractor's E&S document shall provide at least:

- A description of procedures and methods for complying with these general environmental and social conditions, and any specific conditions specified in the ESMP;
- A description of specific mitigation measures that will be implemented in order to minimize adverse impacts;
- A description of all planned monitoring activities and the reporting thereof; and
- The internal organizational, management and reporting mechanisms put in place.

8.0 Health and Safety

r. In advance of the construction work, the Contractor shall mount an awareness and hygiene campaign. Workers and local residents shall be sensitized on health risks particularly of HIV/AIDS.

s. b) Adequate road signs to warn pedestrians and motorists of rehabilitation activities, diversions, etc. shall be provided at appropriate points.

9.0 Reporting

The Contractor shall prepare monthly progress reports to the SE on E&S monitoring with these general conditions, the project E&S safeguards. It is expected that the Contractor's reports will include information on:

- E&S management actions/measures taken, including approvals sought from DFR, DE and EPA
- Problems encountered in relation to E&S aspects (incidents, including delays, cost consequences, etc. as a result thereof);

- Lack of compliance with contract requirements on the part of the Contractor;
- Changes of assumptions, conditions, measures, designs and actual works in relation to E&S aspects; and
- Observations, concerns raised and/or decisions taken with regard to E&S management during site meetings.

10.0 Cost of Compliance

It is expected that compliance with these conditions is already part of standard of good workmanship and state-of-the-art as generally required under this Contract. The item "Compliance with Environmental and Social Management Conditions" in the Bill of Quantities covers these costs. No other payments will be made to the Contractor for compliance with any request to avoid and/or mitigate an avoidable E&S impact.