

ENVIRONMENTAL MANAGEMENT PLAN

FOR THE EU BANANA ACCOMPANYING MEASURES (BAM) SUPPORTED AGRICULTURAL DEVELOPMENT AND MODERNIZATION PROGRAMME (ADMP) FEEDER ROAD PROJECTS

SAINT VINCENT AND THE GRENADINES



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LIST OF ACRONYMS AND ABBREVIATIONS

ADMP	Agriculture Development and Modernization Programme
BAM	Banana Accompanying Measure
BMP	Best Management Practices
BRAGSA	Bridges, Roads and General Services Authority or Roads, Building and General Services Authority
CPD	Central Planning Division
EU	European Union
EDF	European Development Fund
km	Kilometer
MOTWUDLG	Ministry Of Transport Works Urban Development and Local Government
MOA	Ministry of Agriculture
MOF	Ministry of Finance
NAO	National Authorized Officer
PIMT	Project Implementation Management Team
MOL	Ministry of National Reconciliation, Public Service, Labour, and Ecclesiastical Affairs.
SVG	Saint Vincent and the Grenadines
SVGNT	Saint Vincent and the Grenadines National Trust
TORS	Terms of Reference

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1.0 INTRODUCTION

The Environmental Management Plan (EMP) is a management tool that provides link between the potential environmental impacts of the proposed project activities, the proposed mitigation measures to address those impacts, the entity responsible for implementing the mitigative/management measures, monitoring efforts, and a prescribed frequency within applicable existing legislation. This EMP forms part of the Environmental Impact Assessment (EIA) report that was prepared as part of the verification study for the BAM feeder roads project, and must be read within that context.

The civil works to be undertaken under the BAM Feeder Roads Project appear to be straight forward and so standard generic mitigation measures would appear to be applicable which, in addition to any additional measures, consent conditions, or guidelines from review agencies, can be adjusted for each particular sub project site. It is expected that the EMP measures, in combination with best management practices on site, will reduce and manage any potential negative impacts.

The civil contractors will be required to manage their sites responsibly through the complete works process. The mitigative or safe guard measures to be implemented by the contractors to assist in managing the site will be enshrined in the works contracts as environmental clauses so that there is a legal responsibility for site specific environmental management.

Environmental management is a cross sectorial task, and in the context of limited financial and technical resources experienced by SIDS like Saint Vincent and the Grenadines it is expected that the various key Ministries and agencies would collaborate with the designated project management team in order to effectively implement the EMP.

1.1 Description of Project Roads.

Site visits to the road locations were conducted over the period 27 April 2015 to 29th April 2015. The roads area combination of actual feeder road upgrading and the creation of new access or upgrading to proposed agricultural facilities. Detailed site photos can be found Section 4.2.3 and Appendix 8.3 of the EIA, and relevant interviews in Appendix 8.2 for reference. A more detailed engineering review of the roads was provided in the engineering condition reporting of the wider formulation report.

1.1.1 Palmiste/Layou

The Palmiste site is at Layou in the leeward side of the country. The surrounding topography of the areas is flat. The existing feeder road traverses through a residential area and also serves as an access for a quarry operation further inland. The road surface appears to be weathered as a result of the movement of heavy trucks plying the route to and from the quarry site. While the team did not readily observe any, interview with a farmer in the area indicated that there was the growing of such crop as dasheen, tania, sweet peppers, and cucumbers. This road is within close proximity to the archaeologically significant layout petroglyph site.

Issues: dust, noise, sedimentation and construction in adjacent stream, traffic conflicts with quarry, residential, and work vehicles, chemical pollution of stream, lack of road side drainage, chance find of artifacts

1.1.2 Gaskil, Vermont

The Gaskil area is in Vermont on the leeward side of the island. The existing feeder road is narrow, concreted in some parts, and traverses moderate to steep lands serving a wide agricultural area. There was evidence of banana cultivation, ground crop such as eddoes, animal husbandry. There appeared to be small fish in the exiting stream along one point of the road where the river flowed over it at a lower elevation. Where the road surface was cracked or broken, grasses and weeds had grown through.

Issues: Part of road through stream- marine pollution, stream leads to Buccament River which is in a tourist area, effect of works and sedimentation on marine life like crayfish, waste disposal, slope stabilization, removals of road side natural veg to widen road, use of herbicide on road weeds. Utilizes existing boulders in river in retaining works.

1.1.3 Montreal

The Montreal site is in the Marriaquia valley in the windward side of the island near the Botanical gardens and is earmarked for a **greenhouse park**. The existing feeder road is partially of concrete and the remainder of broken asphalt. It traverses gentle to moderately sloping farm lands. The lands were formerly in banana cultivation but are now largely in dasheen. The creation of the green house park would be an important investment towards reducing the import bill for vegetables. The proposed site appeared to be greener than the surrounding lands and farmers interviewed on the site indicated that during times of heavy rainfall, the site became waterlogged and remained so for some time.

Issue: contamination of stream, high water table, drainage, sedimentation from land clearing,

1.1.4 Diamond Estates

This location is in Diamond Estate on the Windward side of the island in close proximity to a number of commercial activities (Diamond Woods and Correa Storage facility) has been identified for the establishment of an **abattoir facility**. There is an existing access road off the main high road into the site that is also used by the existing commercial storage facility as well as providing access to other lands with residential structures. This road has a combination of dirt and worn concrete surface and the proposed upgrading works are to be done on approximately 0.2km of this road. There is presently a dilapidated building on the site that will have to be demolished to accommodate the proposed abattoir facility.

Issues: termite infested timber rafters in dilapidated building, Access also serves commercial and residential area, traffic conflicts with existing residential and commercial traffic, dust to residential area, garbage and solid waste disposal and management

1.1.5 Diamond Village/Sans Soucis

The Diamond Village site is on Government owned property in Sans Soucis on the Windward side of the island on gentle to moderate sloping lands. This site is proposed for a **poultry facility**. There is presently no road to the site, and so a new access road is to be constructed off the main North Leeward Highway into and through the existing property adjacent to the South Central Windward Learning Resource

Centre and the North Union Secondary School to facilitate the proposed activity. The site is presently largely covered in secondary growth vegetation with evidence of some banana crop cultivation to the lower rear.

Issues: proximity to existing institutional facility, Noise, Dust, Traffic management construction traffic off and into Highway, traffic conflicts with patrons and staff of the existing facilities, Storage of materials

1.1.6 Fireburn

The Fireburn feeder road is located in the Windward side of the country and is an existing dirt and crumbled pavement road in a moderate to steeply sloping area. There was evidence in the vicinity of livestock/animal husbandry, along with terraced areas with what appeared to be ground crop. The road is narrow and has some steep drop offs and there was evidence of a land slide. There are residential structures along the road in some areas. While this road was not under BAM initially, the lands that it serves were determined to be very arable but under cultivated areas. The repair of this feeder road, in conjunction with other government initiatives, has the potential to revitalize agriculture within the area.

Issues: land stability, widening of road, safety for workers, service pipe damage, residences, stream in valley

1.1.7 Ferguson

The Ferguson feeder road site is located within the windward side of the island. The agricultural lands serviced by this road are moderate to steep in some areas. There was evidence of ground crop such as tania, yam, and sweet potatoes, along with banana, and also animal husbandry in the form of goats and sheep as part of the farmers' livelihood. The road is narrow with active streams crossing over it at a number of low junctures. There appears to be damage to some aspects of the road and the surface is worn. The team travelled approximately 2.5km along this road.

Discussions with the farmers on site as well as Ministry of Agriculture officials indicated that the road had been damaged by the previous recent heavy storms and that part of the road had actually been washed away. Its poor condition prevented farmers from realizing shorter travel times between harvesting and market especially as an upland link road for the wider farming community.

Issues: sedimentation and chemical pollution of streams, solid waste disposal into stream, slope destabilization, traffic management,

1.1.8 Dandrade in Rabacca, Georgetown

The Dandrade site in the Windward side of the island in Orange Hill off the main highway and is proposed for a greenhouse park for large scale vegetable cultivation. This road will also provide access to additional farm lands. There was no residential development in this area and the lands are flat to moderately sloping with some evidence of cultivation of banana as well as ground cop such as tania, eddoes, and potatoes. Secondary growth of natural vegetation was also evident in much of the area visited. Limited livestock was observed. Approximately 1 km of this road was travelled in which it was

observed that the road was narrow in some places and the road surface appeared intact some places and broken in others. Drainage was damaged and overgrown.

Issues: width of road especially if trucks are to travel to the green houses and other farms beyond on a regular basis, Signage to inform of ongoing works during rehabilitation/construction, and later for access into road off the main high road during operation of farm, Dust affecting existing crops from works on road.

1.1.9 Additional Road for Consideration-Verivine

Following consultation with the Ministry of Agriculture officials, it was suggested that the team revisit the Gaskil, Vermont road selection and consider the inclusion of the **Verivine** road instead in the same proximity because they were of the opinion that this road was in better condition than Gaskil, and by reason of its location, provided access to a much wider collection of moderately sloped farming areas that would allow for a large selection of vegetables to be grown. This would provide better value or economic return on the infrastructural investment benefiting a wider net of farmers compared to steeper Gaskil slopes. The consulting team visited this road on the 29th April, and travelled its length for approximately 1 km to determine its condition. While the engineering team reviewed this road, they found it to be comparable in general condition to the Gaskil road. The Ministries of Finance, and of Agriculture would have to decide on whether or not to include this road for attention as part of this project.

1.2 General Scope of Road Works

The general poor condition of the feeder roads lead to costly and difficult access to farms. After site visits to the selected roads, and based on previous road works experience, the general scope of works to address the condition of the roads under the project may be summarized as follows.

1. All roads will be traversed by a surveyor prior to any construction commencement. He will place identifiable markers (chainages) at regular intervals along the route (usually 20m) which will record the distance along the route from the starting point.
2. The entire route is to be cleared of bush, overgrowth and landslides prior to construction commencement. Drains are to be cleared of debris, and other blockages, culverts are to be inspected and cleared of blockages.
3. Disposal sites are to be identified and method of disposal of debris, trees or other matter is to **be** agreed and stated in the contract.
4. Sections of excessive damage, restricting access, are to be scarified and graded to allow for better accessibility prior to construction of layers.
5. Generally drainage construction will precede road construction. Same for culvert construction and retaining wall construction.

6. Where the surface layer only is to be reconstructed, the existing surface will be scarified to expose the base layer, a regulating layer base applied to conform to the road profile, shaped and compacted. The section is to be proof rolled using a loaded 15 ton truck to check for soft spots prior to application of final layer. Soft spots are to be excavated and underlying material replaced with sub base material up to the base layer, regulated, base applies and compacted. The surface or wearing course (concrete or asphalt) will then be laid onto the base layer.
7. Where the base and/or sub base layers are to be reconstructed, the existing material will most likely be contaminated and unfit for reuse. The existing material is to be removed and disposed of in the approved manner. A fresh layer of base or sub base applied and compacted. The section is proof rolled and repaired as required and the next layer applied.
8. Where there exist no road pavement, the ground is to be stripped of vegetation, shaped and the subgrade tested. Based on the road design, the section may require improving the bearing capacity of the road by replacement with a hardcore layer. The section is to be proof roller prior to application of the sub base. Repairs to soft areas are to be effected prior to application of the next layers.

While this description is a logical generalization of the steps to be undertaken, where necessary, site specific modifications will be made to ensure properly designed and constructed feeder road (Lead Engineer, Amarna Consult Limited). On site conditions may determine that certain aspects of the scope of the work are adjusted accordingly to appropriately address any challenges and still ensure the project meets all required standards and functionality.

2.0 OVERVIEW OF POTENTIAL IMPACTS

The proposed works are largely civil in nature and it is expected that during work activities there will be a number of impacts on the existing surrounding environment. The effective management of these impacts utilizing practical measures and best management practices will reduce the potential negative and enhance the positive impacts of the overall project. Most of the negative impacts associated with the road projects are expected to occur during construction phase and are not expected to be major if managed responsibly. Impact areas are generally interlinked as activities tend to have repercussions or interlinkages with other actions or impacts.

2.1 Positive Impacts

There are a number of potential positive impacts from the construction of the roads and these will only be highlighted here, as the general focus of the document will be on the potential negative impacts, and mitigative measures to address them during works.

The most obvious positive impact is the national benefit of the **reduction of the level of poverty** in the farming communities, ensuring livelihoods, increasing productivity and quality, and increasing food security nationally. With each road project there may be certain specific positive impacts that can be summarized as follows:

2.1.1 Increased Employment Opportunity

There is the potential for increased employment opportunity for community members with construction skills to be employed on the road works even though it is for a medium term duration. This is especially relevant as the communities affected are supposed to be some of the poorest agricultural communities. Table 4.2 below is extracted from section 4.5.2.1 of the EIA and is sourced from the Statistics Department of Saint Vincent and the Grenadines. It displays data showing the amount of able bodied persons with construction related skills that can be a source for onsite employment for each community within which one of the project roads and attendant works fall.

Table 4.2 Population of targeted agricultural communities in Agriculture and Construction (Extracted from section 4.5.2.1 of the EIA).

Community	CD	ED	Total Pop.	No. Of Adults: 15 - 50 yrs	No. Of Persons in Agriculture	No. Of Persons in Construction related fields
Palmiste	Layou (09)	09130/ 09122	877	442	15	36
Gaskil	Layou (09)	09080/ 09072	424	236	62	15
Montreal	Marriaqua (04)	04122	395	240	35	9
Diamond Estate	Calliaqua (03)	03424	278	167	8	25

Diamonds Village	Colonaire (06)	06022/ 06030/ 06012	926	465	88	24
San Souci	Colonaire (06)	06021	416	246	31	18
Firebun	Colonaire (06)	06011	342	155	10	9
Ferguson	Colonaire (06)	06071	542	296	19	29
Dandrade/Rabacca	Georgetown (07)	07150/ 07130	781	413	79	32

Source: Statistics Department, May 2015

2.1.2 Improved Access to Existing Farms

Improving the access the farm lands via widening and improved surfacing of the feeder roads will allow farmers to be able to get to their farms faster, and likewise transport their goods by pickup or larger vehicles to market more quickly. During this study a number of farmers complained that the lack of proper access to farmlands and concurrently to markets with their harvested crops was a major concern affecting the quality of the produce that reached the market place as well as level of returns. This, in conjunction with the price of inputs negatively affected their efforts and livelihoods. (Interview with farmers 27th to 29th April 2015 Appendix 8.2 in EIA).

2.1.3 Accessing Additional Lands

With the improved roads, there would also be the opportunity to access additional lands that were previously difficult to do in the past. This would pose the opportunity to increase the quantum of available farmlands and concurrently, with appropriate methods, increase gross production levels.

2.1.4 Improved Response to Praedial Larceny Occurrences

The occurrence of praedial larceny was a consistent major sore point for all of the farmers interviewed as well as highlighted by the Ministry of Agriculture. The improved roads would allow for quicker response times to the occurrence of these incidents by both farmers and relevant authorities such as the police.¹

2.1.5 Improved Roads as Part of National Emergency Response Network

The upgraded feeder roads can now become a component of the wider national road network and function as bypass or emergency routes where feasible in times of localized emergencies or national disasters. This is also contingent on these roads being rehabilitated up to nationally accepted road standards.

¹ On the flip side to this point was the concern by some farmers that with the improvement in the road system, thieves would have better access to the farms and so praedial larceny would increase.

2.1.6 Increased Opportunity for linkages with other Agricultural initiatives

The improved feeder roads must be perceived within the wider context of agricultural improvement to which other projects are also partner initiatives. The improved access increases the opportunity to provide services to the farmlands such as irrigation infrastructure as an example which falls under other project initiatives and donor agency efforts.

2.1.7 Better Control of Run off

The rehabilitated roads would require proper drainage in order to not only prolong their life span, but also the drain adjacent lands adequately. The improved control of runoff through road side drains to main water courses, along with proper contoured drainage of the cultivated areas, would assist in reducing the vulnerability of adjacent slopes to land slippages and crop loss during storm events.

2.1.8 Increased Business for Construction Material and Service Suppliers

There will be the opportunity for the commercial suppliers of the materials and equipment required for the project to experience short to medium term increased business and income generation as a result of the projects. This would also apply to the construction of the abattoir, greenhouse, and poultry farm facilities later.

2.1.9 Increased business and income generation for local Community

There will be the opportunity for increased business and income generation for local enterprising cooks, eating places, and refreshment houses to cater to the needs of the construction workers as necessary.

2.1.10 Potential for employment in Agricultural facilities

The potential employment opportunities for community persons to seek and obtain employment with the proposed facilities such as the greenhouses, abattoir and poultry facility.

Efforts to maximize the positive benefits of the works should be sought during design and project implementation.

2.2 Negative Impacts

There is the possibility of the occurrence of the following negative impacts associated with the projects.

- Increased traffic and potential for traffic conflict
- Increased Vibration and Noise levels
- Poor Solid and Liquid Waste Management
- Deforestation and loss of habitats
- Air pollution
- Riverine/Marine pollution and impacts on marine habitats
- Terrestrial pollution

- Soil erosion and land slippage
- Occupational Health and safety issues
- Loss of or damage to historical or cultural artefacts

The impacts highlighted above are detailed below.

2.2.1 Increased Traffic and Potential for Traffic Conflict

The road construction and rehabilitation projects will generate increased construction-related traffic into the various site locations. These will range for small vehicles carrying workers or staff, to large tonnage vehicles carrying building material. Increased traffic loads can contribute to damage to existing roads that are not part of the project and were not designed to accommodate such wear and tear. There is also an attendant increased noise factor. The potential for vehicular/vehicular and pedestrian/vehicular conflict increases as the scale of construction increases if proper traffic management procedures are not implemented. This can lead to very tempered negative response from the nearby residents or the community affected. Of particular note is the Layout community where residences are close to the road way. In cases such as Diamond Estate, there is the possibility of traffic disruption to existing businesses, and this must be handled in a manner that there is minimal interference with such operations.

The feeder roads are generally narrow and the matter of safety becomes a great concern in relation to the speed of the vehicles as well as the alertness of the drivers as they traverse the roads through communities especially if there are children within the vicinity who may be accustomed to playing on or along the side of the roads. The breakdown of a large project vehicle causing the blockage of a narrow road used by farmers or residents can escalate tensions within a community especially if it contributes to loss of travel time to farmlands, market, school, or returning home after a hard working day. Alternative bypass routes must be explored where the situation applies. There is the matter of construction vehicles turning into or off of a main highway as for example what may happen at San Soucis and this can cause blockage or the increased potential for vehicle accidents. There would be need for proper signage couple with experience, caution, and a proper traffic management plan.

2.2.2 Increased Noise and Vibration levels

Increased noise and vibration levels through construction activities such as the movement of heavy supply trucks or cement mixers into and out of the site, the use of various forms of heavy equipment such as demolition equipment, can have negative impacts on both the terrestrial and marine environments especially along the coast as well as in the forested areas. In secluded or forested areas, fauna habitats can be disturbed causing such creatures to flee their homes and nesting areas. Similarly, increased noise levels from activities adjacent to or within communities and residential areas, can be deemed as an unnecessary and unwanted nuisance affecting local businesses and day to day activities. Care must be taken in the judicious usage of any form of heavy noise and vibration equipment. Associated vibrations from the use of heavy equipment such as rollers can negatively impact surrounding communities, causing nuisances by shaking household items and possibly affecting the stability of nearby structures. A major factor is also the working hours of the project during which activities occur.

2.2.3 Poor Solid and Liquid Waste Management Practices

The improper management and disposal of both solid and liquid wastes can be detrimental to both the terrestrial and to the nearby marine environment. The mishandling of construction wastes such as chemicals, detergents, greases, oils, building materials, can lead to the poisoning of the terrestrial environment. The entry into the marine environment of any waste or chemical, either through runoff, in drains, or are blown by the wind, they can also poison the marine environment or damage the fragile marine ecosystem. Riverine life such as crayfish, eels, and some small fish exist within the upland areas and these are eaten by some residents.

The management of human wastes on site is very critical as well to ensure a healthy working environment and reduce the risk of faecal contamination. The management of food wastes is also critical to reducing the incidence of vector entry into an area and infestation.

The burning of waste materials such as lumber, paint and chemical containers, cement and other paper based products has been a practice amongst contractors for some time, this practice can be indiscriminate and during the dry season pose the risk of starting bush fires. Plastic and chemical containers emit toxic fumes when burnt and these are hazardous to both animals and humans in close proximity. It must be remembered that the projects are generally within agricultural based areas, and care must be taken to avoid contamination of any soil or water upon which the practice relies.

2.2.4 Debushing and Removal of Natural Vegetation

The practice of land clearing and excavation practices to accommodate project activities which involves the removal of large amounts of mature vegetation, can lead to loss of fauna and flora habitats. This is especially critical in a forested areas where there is the threat to endemic species. Disturbance of forested areas can also contribute to the loss of biodiversity. Particular care must be exercised during project activities to ensure there is minimal intrusion and careful monitoring of all such works.

Debushing also exposes soils to the elements and make them vulnerable especially during heavy rainfall events as the vegetative cover and root systems have been destroyed or removed allowing increased runoff rather than percolation. Such areas, especially if located on slopes, become vulnerable and are susceptible to landslides that threaten flora, fauna, and human life and activities. Even more vulnerable are the banks of rivers and streams which are prone to easy collapse when disturbed. Prudence must be taken in managing this practice, and where possible utilize manual rather than mechanical or chemical means to undertake the task and so reduce the extent of the potential impacts.

2.2.5 Air Pollution

Air pollution can originate from a number of sources. The vehicles and machinery being utilized in the road construction process can produce noxious fumes such as carbon monoxide, diesel fumes, as well as burnt oil fumes. There is the increased potential for air pollution to emanate from older or improperly service vehicles and machinery as well. Dust also arises from activities such as driving over unpaved

roads and tracks, the clearing of dry lands, the dumping of loose materials or fines in combination with the presence of prevailing wind conditions. Cleared land that has been exposed to the sun and is dried can also produce dust when the wind blows over it and carries this material to nearby residences or communities. Similarly, uncovered stockpiled fines such as sands or even cement can be light enough to be blown by the wind. This is a nuisance to nearby facilities, communities, or even farms where crops may be covered in dust.

The mishandling of particularly noxious chemicals such as solvents, pesticides, herbicides, chemical washes, greases, as well as the burning of solid wastes on the construction site, especially chemical containers, can also lead to air pollution. The resultant impact is poor ambient air quality and the increased potential for resultant negative health effects on workers as well as nearby communities.

2.2.6 Terrestrial and Marine Pollution

Improper storage, disposal, or just mismanagement of garbage or construction wastes can lead to such material being transported by wind or rainfall into drainage systems or over the landscape, and eventually into the marine environment contributing to pollution. With the occurrence of civil works projects along or adjacent to streams and rivers, there is the possibility of impact on the marine ecosystem. Eventually, the cumulative impacts of such activities do reach coastal waters and affect coastal marine life. Inland works are not exempted, as any material that finds its way into a gullied river or waterways, eventually finds its way to the coastal waters.

The potential for terrestrial and marine pollution can occur from a number of sources which include erosion and land slippage from excavation and land clearing as well as the indiscriminate management of, including disposal of both solid and liquid wastes. The mishandling of chemicals and especially waste oils during construction activities is critical and can poison the landscape. Spillages or leaks from fuels stations or during refueling and servicing of vehicles and equipment can also be a contributing factor. The same would apply to cementitious materials as well. Pesticides and herbicides used along roadsides for debushing purposes also carry dangers when washed into nearby ravines or the empty containers are improperly disposed of. During rainfall events, chemicals can mix or be carried with runoff and create liquid wastes that impact both terrestrial and marine environments. Improper disposal of human wastes can lead to similar effects. This also applies to the use of pesticides and insecticides to treat termite infestation. The impacts especially within the streams and rivers would be on the small riverine fauna, on the drinking water for animals, and the water used for irrigation.

2.2.7 Soil Erosion and Land Slippage

The practice of land clearing such as grubbing, excavation practices, and topographic restructuring can loosen existing soils and expose these soils to the elements making them vulnerable to erosion. Such soils can be blown as dust contributing to air pollution. The exposed soil, subjected to precipitation, especially during storm events, and/or water from poor site drainage, can become saturated, and when its limit is reached, lead to land slippage especially on steep slopes. Saint Vincent is particularly vulnerable to such an event by reason of its topography.

Landslides can block transportation and communication routes resulting in damage to infrastructure and associated services such as electricity and water which a population relies on for survival. Eventually,

this material can wash down into rivers and then to the sea causing siltation and sedimentation. The resulting effect within the coastal marine environment, can lead to pollution, especially if there are any hazardous materials in the soil, and this can lead to the destruction of the marine ecosystem. This would threaten the livelihoods of those who depend on this environment for their living. Appropriate measures must be incorporated into the project planning and implementation that reduces and controls soil erosion and land slippage and should also involve rapid rehabilitation or revegetation where possible.

Slopes can also be destabilized by vibrations from heavy equipment such as rollers or excavators and general work activities. The slope may be below the road level, as for example in Fireburn, and vegetation clearing and work activity, in conjunction with the nature of the soil, can cause slippage removing part of the road, and causing loss of equipment and life.

2.2.8 Occupational Health and Safety Issues

Worker safety is critical to any operation. The mishandling of equipment, the improper storage and usage of various chemicals and construction materials on site, poor and unsafe working conditions, high levels of continuous noise and fumes, as well as inadequate safety equipment can cause serious injury and down time to the workers and project. The relevant best management practices to ensure worker safety as well as acceptable working conditions will have to be implemented along with adherence to the appropriate local legislation that govern health and safety. Proper facilities will need to be provided for all waste disposal as well as for workers so that they are able to dispose of their solid wastes, as well as sanitary wastes without any negative impacts on the environment.²

While the cursory inspection of the existing dilapidated building at Diamond Village was external, and there was no evidence of any asbestos, the addition of a mention of the negative impact of the potential presence of asbestos in the abattoir building is added just as a precaution. Additionally, working on slopes or in areas with steep drops can be potentially hazardous if proper care is not taken or adequate safety measures implemented and monitored.

2.2.9 Damage to Existing Services – Water, Electricity, Communications

During the road construction works, especially in areas with residences such as Layou and Fireburn, there is always the possibility of impacting on existing service infrastructure such as water pipes, electricity, and communication lines. Care must be taken to avoid damaging these lines and depriving the communities of such services for any length of time. This creates dissention towards the project when such occurs. It will be necessary for the contractor to walk and survey the site to determine the location of any services and in consultation with the service companies, determine how he will address any damages in a rapid manner reducing down time on the project.

2.2.10 Spreading Termite infestation

² Interviews with the Labour Commissioner and the Deputy Labour Commissioner on 8th May 2015 indicate that while their department is not normally consulted on these projects, they only become involved if there is an accident and even when the guiding legislation, Factories Act is outdated. They are presently in the process of trying to get updated and effective Occupational Health and Safety Bill and regulations implemented. They were very interested in being part of a monitoring effort.

One of the projects involves the creation of an improved access road to a proposed abattoir facility at Diamond Estate. During the site visit, it was observed that an existing dilapidated building on the site displayed evidence of termite infestation in the rafters. Care will need to be taken in demolishing, treating, and removing this infected material so that the spread of this infectious pest to surrounding properties is minimized. Additionally, the soil will need to be treated and this would also have to be undertaken in a responsible manner to avoid any nuisance to nearby residents.

2.2.11 Damage to Historical and Cultural Artifacts

During construction activities, there is the possibility of coming across or “chance finding” what may appear to be a historical or cultural artifact which may need to be studied and preserved by the relevant authorities. Layou has a petroglyph within the vicinity of the feeder road and while the possibility of discovering a similar artifact during rehabilitation of the feeder road may be questionable, the chance does exist and precautions would have to be taken. An artifact can be lost due to careless construction activities prior to the relevant authorities determining whether or not it is worthy of preservation. The damage or loss to any artefact would be loss to the patrimony and history of Saint Vincent and the Grenadines, and this must be avoided.³

³ Mrs. Phillips the Director of the National Trust was adamant that a clause be placed in the EMP to ensure that if any artifact is discovered that the Trust is informed at once and that all works stop. Vigilance would be required in the Palmiste layou area. (Interview 12 May, 2015).

3.0 Proposed Mitigative Measures

The proposed mitigative measures are meant to be practical actions to address the potential impacts of the project activities and in so doing, reduce or avoid any negative impact on the environment. Most of the negative impacts associated with the road projects are expected to occur during construction phase. While these impacts are not expected to be major, the careful implementation of mitigative measures will allow for the reduction or avoidance of adverse short, medium, and long term effects. It is expected that the projects would receive adequate technical review by qualified technical professionals to ensure technical, and environmental soundness, from design to implementation, and function. Engineering review for all construction details and designs must be integral in this process.

The following Table 4.3 below, extracted from the main Environmental Impact Assessment document undertaken for the BAM Feeder Roads Project, provides a list of the potential general impact areas and of the proposed mitigative measures to address these impacts. The measures are presented in a manner that makes them easily incorporated as environmental clauses in the contract for the contractors' works with the appropriate legal wordsmithing. This also facilitates ease of monitoring by the relevant agencies.

These are the mitigation measures which are expected of all professional contractors who are performing civil works, and represent the minimum standard of execution for environmental protection during the execution of such works.

Table 4.3 Impact Areas and Mitigative Measures (Extracted from main EIA document)

	POTENTIAL IMPACT AREAS	MITIGAIVE MEASURE
1	Traffic Management impacts	<ul style="list-style-type: none"> (a) A traffic management plan must be developed and implemented by contractor in consultation with the Ministry of Transport and the Traffic Department of the Royal St. Vincent and the Grenadines Police Force. (b) Alternative routes to be identified in the instance of extended road works, road blockages, or emergencies. (c) The public to be notified of all disturbances to their normal routes. (d) Signposting, warning signs, barriers and traffic diversions must be clearly visible from all directions into and out of the site. (e) The contractor must engage in informing the public of all potential hazards through public meetings and PSAs. (f) Provision must be made for the safe passages and crossings for all pedestrians where construction traffic interferes with their normal route. (g) There must be active traffic management by trained and visible staff at the site or along roadways as required to ensure safe and convenient passage for the vehicular and pedestrian public.

		<ul style="list-style-type: none"> (h) Adjustment of working hours to facilitate local traffic patterns, e.g. avoiding major work activities during rush hours or times of livestock, or agricultural produce movement. (i) All material and equipment must be stored and secured in designated areas that do not interfere traffic flows or contribute to traffic conflicts
2	Soil erosion, land destabilization, and slippage	<ul style="list-style-type: none"> (a) The contractor must ensure that appropriate erosion control measures such as silt fences are installed. (b) Proper site drainage must be implemented, including drainage at the tops of slopes, around slopes, and beneath roadways. (c) Any drain clogged by construction material or sediment must be unclogged as soon as possible to prevent overflow and flooding. (d) The use of retaining structures and planting with deep rooted grasses to retain soil during and after works must be considered. (e) The use of green or bio-engineering methods must be considered as a measure to reduce erosion, stabilize slopes, and reduce the potential for land slippage. (f) River and stream banks should be replanted immediately with deep rooted grass as part of the retaining measures to maintain bank integrity. (g) Keep angle of all slopes within limits of soil type. (h) Balance cut and fill to limit steepness of slopes. (i) All slopes and excavated areas must be monitored for movement. (j) No excess material must be stored on any slope.
3	Noise and Vibration	<ul style="list-style-type: none"> (a) The contractor must develop and implement a public notification and noise management plan. (b) Construction/work activities must occur within specified daylight hours e.g. 8:00 am to 4:00pm. (c) Community/public to be informed in advance of any work activities to occur outside of normal working hours or on weekends. (d) Sites within close proximity to residences, schools, or any habitable buildings, or open directly onto a highway, should be hoarded wherever possible. (e) During operations, the engine covers of generators, air compressors and other powered mechanical equipment shall be closed, and equipment placed as far away from residential areas as possible. (f) There will be no excessive idling of construction vehicles at sites. (g) Noise suppression equipment or systems supplied by manufacture will be utilized.

		(h) Ensure all vehicles and equipment are properly serviced.
4	Removal of natural vegetation / debushing	<ul style="list-style-type: none"> (a) There must be no unnecessary clearing of natural vegetation along lands, slopes, road ways, or river banks that would contribute to slope instability or erosion. (b) Avoid the use of herbicides or other chemicals to remove vegetation. (c) Where ever possible, utilize manual labour for site vegetation clearing. (d) Offer farmers cut vegetation first so that they may have the opportunity to utilize it as compost rather than indiscriminately disposing of it. (e) The contractor must avoid leaving sites debushed or cleared for extended periods of time that are unnecessary. (f) In the event that a wide expanse of land is to be left bare for an extended period of time, measures such as silt fences must be placed around the site to prevent runoff and sedimentation. (g) No removed vegetation must be disposed of in any river or waterway. (h) Any works to be undertaken in any nationally designated protected forest area must be done under the supervision of a representative of the Forestry Department. (i) There must be minimal impact to flora and fauna in the surrounding areas as far as possible.
5	Poor Air Quality	<ul style="list-style-type: none"> (a) Construction sites within close proximity to residences, schools, or any habitable buildings, or open directly onto a highway, should be hoarded wherever possible (b) Construction materials such as sand, cement, or other fines should be kept properly covered. (c) Cement should be kept stored within a shed or container. (d) The sand and fines should be kept moistened with sprays of water if left uncovered. (e) Unpaved, dusty construction roads should be compacted and then wet periodically. (f) Demolition debris shall be kept in controlled area and sprayed with water mist to reduce debris dust. (g) During pneumatic drilling/wall destruction dust shall be suppressed by ongoing water spraying and/or installing dust screen enclosures at site (h) The surrounding environment (sidewalks, roads) shall be kept free of debris to minimize dust. (i) There will be no open burning of construction/waste material on the site at any time. (j) There will be no excessive idling of construction vehicles at sites.

		(k) The bins of all haulage vehicles transporting aggregate or building materials must be covered on all public roads.
6	Termite infestation	<ul style="list-style-type: none"> (a) Contractor must include termite treatment as part of his chemical and hazardous chemical management plan. (b) Sites should be hoarded wherever possible during demolition. (c) Treat building and infested area with approved insecticide or termite treatment approved by the Ministry of Health. (d) Only licensed and registered pest control professionals with training and knowledge of proper application methods and techniques should be utilized. (e) Ensure equipment utilized for application of termite agent is appropriate and approved by the Ministry of Health and any relevant chemical control Authority. (f) Appropriate chemical management measures must be implemented to prevent contamination of surrounding areas. (g) The bins of all haulage vehicles transporting termite infested lumber or materials must be covered on all public roads.
7	Marine and Terrestrial pollution	<ul style="list-style-type: none"> (a) The contractor must implement all necessary waste management plans and measures. (b) All construction materials, including chemicals, must be properly stored. (c) If any pesticide and herbicide applications are undertaken at all, they must be carefully supervised. (d) All empty or remnant pesticide and herbicide containers must be properly disposed of according to applicable health and waste management legislation. (e) The contractor will establish appropriate erosion and sediment control measures such as hay bales, sedimentation basins, and/or silt fences and traps to prevent sediment from moving off site and causing excessive turbidity in nearby streams, rivers, wetlands, and eventually coastal waters. (f) If works are to be done along or near major streams and rivers, water quality monitoring must be done before construction, and at regular intervals during construction to determine turbidity levels and other quality parameters. (g) Appropriate soil erosion and slippage mitigation measures must be implemented. (h) Construction vehicles and machinery will be washed only in designated areas where runoff will not pollute water bodies. (i) All equipment and vehicles must be fueled or serviced in specially designated areas that are specially created or

		<p>maintained to mitigate the spread of any spill.</p> <p>(j) There must be no unlicensed borrow pits, quarries or waste dumps created.</p>
8	Occupational Health and safety/ worker impacts	<p>(a) The contractor must ensure that an Occupational Health and Safety Plan is in place to guide work activities, and provide a safe environment for workers.</p> <p>(b) The contractor must ensure that all workers operate within a safe environment as specified by the Labour Department.</p> <p>(c) All relevant Labour and Occupational Health and Safety regulations must be adhered to ensure worker safety.</p> <p>(d) Workers must be provided with necessary equipment as well as protective gear as per their specific tasks such as hard hats, overalls, gloves, goggles, boots, reflective vests, etc.</p> <p>(e) Appropriate warning signs must be posted and clearly visible.</p> <p>(f) Appropriate safety measures must be implemented for all workers working on slopes or near steep drops.</p> <p>(g) Sanitary facilities must be provided for all workers on site.</p> <p>(h) The contractor must ensure that there are basic medical facilities on site and that there are staff trained in basic first aid.</p> <p>(i) Appropriate posting of information within the site must be done to inform workers of key rules and regulations to follow.</p> <p>(j) (h) Emergency numbers and locations of facilities must be posted within the site and all workers informed of this information.</p>
9	Chance finds and Loss of or damage to Historical and Cultural Artifacts	<p>(a) The contractor must ensure that provisions are put in place so that artifacts or other possible “chance finds” encountered in excavation or construction are noted and registered, responsible Authorities such as the National Trust is contacted, and works activities delayed or modified to account for such finds.</p> <p>(b) No item believed to be an artifact must be removed or disturbed by any of the workers.</p> <p>(c) All work must stop until the Authorities such as the National Trust has secured the find and gives approval to continue work</p>
10	Solid and Liquid Waste Management (general)	<p>(a) Contractor to develop and implement waste management plan in consultation with the Solid Waste Management Authority.</p> <p>(b) Contractor to abide by all pertinent waste management and public health laws.</p>

		<ul style="list-style-type: none"> (c) Waste collection and disposal pathways and sites will be identified for all major waste types expected from demolition and construction activities. (d) Construction and demolition wastes will be stored in appropriate bins. (e) Liquid and chemical wastes will be stored in appropriate containers separated from the general refuse. (f) All waste will be collected and disposed of properly in approved landfills by licensed collectors. (g) The records of waste disposal will be maintained as proof for proper management as designed. (h) Whenever feasible the contractor will reuse and recycle appropriate and viable materials (except asbestos or other hazardous material). (i) Construction related liquid wastes must not be allowed to accumulate on or off the site, or to flow over or from the site in an uncontrolled manner to any streams, or to cause a nuisance or health risk due to its contents. (j) All organic and food wastes are to be properly stored and disposed of to reduce any incidence of vector infestation. (k) There must be no burning of any wastes on site. (l) Upon completion of the project, all wastes must be immediately removed from the site. (m) All removed wastes must be disposed of at approved waste disposal sites.
11	Solid and Liquid Waste Management (hazardous substances)	<ul style="list-style-type: none"> (a) Contractor must develop a Chemical and hazardous waste management plan and have it reviewed and approved by the Solid Waste and any other relevant authorities. (b) Contractor must provide temporary storage on site for all hazardous or toxic substances in safe containers labeled with details of composition, properties and handling information. (c) The containers of hazardous substances shall be placed in a leak-proof container to prevent spillage and leaching. (d) The wastes shall be transported by specially licensed carriers and disposed in a licensed facility. (e) There must be no waste dumps created or burning of chemical containers on site. (f) Paints with toxic ingredients or solvents or lead-based paints will not be used. (g) Banned chemicals will not be used on any project. (h) There must be a designated secured area for the storage of fuels on site. (i) There must be a designated, secured area with appropriate sumps and low retention structures for the fuelling of vehicles or machinery on site. (j) All fuelling must be carefully supervised. (k) Upon completion, all wastes must be immediately

		<p>removed from the site.</p> <p>(l) All wastes must be disposed of at approved waste disposal sites.</p>
12	Solid Waste Management (asbestos)	<p>(a) If asbestos is located on the project site, it shall be marked clearly as a hazardous material.</p> <p>(b) If work has already commenced, all work in the area must stop immediately.</p> <p>(c) An asbestos management plan must be prepared by the contractor and approved by the relevant local health and waste management authorities.</p> <p>(d) Where possible the asbestos and its location must be appropriately contained and sealed to minimize exposure.</p> <p>(e) The asbestos, prior to removal (if removal is necessary) will be treated with a wetting agent to minimize asbestos dust.</p> <p>(f) Asbestos will be handled and disposed by skilled & experienced professionals using appropriate PPE (personal protective equipment) such as respirators and tyvec suites.</p> <p>(g) If asbestos material is to be stored temporarily, the wastes should be securely enclosed within closed containers and marked appropriately.</p> <p>(h) Security measures must be implemented against unauthorized removal of asbestos from the site.</p> <p>(i) Absolutely no removed asbestos will be reused.</p> <p>(j) The removed asbestos must be disposed of at an approved waste disposal site or facility.</p>
13	Damage to Services	<p>(a) Contractor to ensure a detailed survey is undertaken of the full road length and note the presence of all services electricity, water, or communications, whether above or below ground.</p> <p>(b) Consultation must be undertaken with all relevant service companies prior to construction to minimize damage and disruption of services.</p> <p>(c) In the event of damage to any service line, the relevant agency must be notified immediately to effect repair.</p> <p>(d) Work must not continue that compounds the situation until the damage has been repaired to the satisfaction of the service company.</p>

Additional mitigative measures may be added derived from any specific conditions imposed by any agency who would review the road designs, as well as onsite inspections, as the projects progress. These additional recommendations can be converted to contract clauses where or as necessary in a manner to foster compliance or failing which, provide for determined penalties.

4.0 Environmental Management Plan (EMP) Elements

4.1 Elements

Table 4.4 below, extracted from the Environmental Impact Assessment document for the project, provides a listing of the category of projects, the potential general negative impact areas, the proposed mitigative measures, entity responsible for implementing the mitigative measures, the entities responsible for monitoring, and the frequency level of that monitoring effort.

Table 4.4. Standard Minimum Elements of the Environmental Management Plan (EMP)

	Category of Project	Impact Area	Mitigative Measures	Mitigation Responsibility	Monitoring Responsibility	Frequency
1	Demolition of existing building.	Traffic Impacts	As per mitigative measures (a) to (i)	Contractor	MOTWUDLG Contractor	Weekly Daily
		Noise and vibration	As per mitigative measures (a) to (h)	Contractor	MOTWUDLG MOH Contractor	Weekly Daily
		Poor Air Quality	As per mitigative measures (a) to (k)	Contractor	MOTWUDLG MOA, MOH Contractor	Weekly Daily
		Termite Infestation	As per mitigative measures (a) to (g)	Contractor	MOTWUDLG MOA, MOH Contractor	Weekly Daily
		Occupational Health and Safety Issues	As per mitigative measures (a) to (j)	Contractor	MOTWUDLG MOA, MOH Contractor	Weekly Daily
		Solid and Liquid Waste Management (general)	As per mitigative measures (a) to (m)	Contractor	MOTWUDLG MOA, MOH Contractor	Weekly Daily
		Solid and Liquid Waste Management (hazardous)	As per mitigative measures (a) to (l)	Contractor	MOTWUDLG MOA, MOH Contractor	Weekly Daily
		Solid and Liquid Waste Management (Asbestos)	As per mitigative measures (a) to (j)	Contractor	MOTWUDLG MOA, MOH Contractor	Weekly Daily

		Damages to Services	As per mitigative measures (a) to (d)	contractor	MOTWUDLG MOA Contractor	Upon event Daily
2	New Green House Building and general construction	Traffic Impacts	As per mitigative measures (a) to (i)	Contractor	MOTWUDLG MOA. Contractor	Weekly Daily
Soil Erosion and Slippage		As per mitigative measures (a) to (j)	Contractor	MOTWUDLG MOA Contractor	Weekly Daily	
Noise and Vibrations		As per mitigative measures (a) to (h)	contractor	MOTWUDLG MOA, MOH (upon complaint) Contractor	Weekly Daily	
Removal of vegetation/ debushing		As per mitigative measures (a) to (j)	Contractor	MOTWUDLG MOA, MOH. Contractor	Weekly Daily	
Terrestrial and Marine Pollution		As per mitigative measures (a) to (h)	contractor	MOTWUDLG MOA MOH (Upon Complaint). Contractor	Weekly Daily	
Poor Air Quality		As per mitigative measures (a) to (k)	Contractor	MOTWUDLG MOA MOH (Upon complaint). Contractor	Weekly Daily	
Occupational Health and Safety Issues		As per mitigative measures (a) to (j)	contractor	MOTWUDLG MOA, MOH, MOL (Upon complaint). Contractor	Weekly Daily	
Solid and Liquid Waste Management (general)		As per mitigative measures (a) to (m)	Contractor	MOTWUDLG MOA, MOH. Contractor	Weekly Daily	
Solid and Liquid Waste Management (hazardous)		As per mitigative measures (a) to (l)	Contractor	MOTWUDLG MOA, MOH. Contractor	Weekly Daily	
Loss of or damage to		As per	Contractor	MOTWUDLG	Weekly	

		Historical and Cultural Artifacts	mitigative measures (a) to (b)		MOA, SVGNT (Upon discovery). Contractor	Daily
3	Road construction and rehabilitation	Traffic Impacts	As per mitigative measures (a) to (i)	Contractor	MOTWUDLG, MOA Contractor	Weekly Daily
		Noise and Vibrations	As per mitigative measures (a) to (h)	contractor	MOTWUDLG, MOA, MOH (upon complaint). Contractor	Weekly Daily
		Poor Air Quality	As per mitigative measures (a) to (k)	Contractor	MOTWUDLG MOA, MOH. Contractor	Weekly Daily
		Removal of vegetation/ debushing	As per mitigative measures (a) to (j)	Contractor	MOTWUDLG MOA; MOH; Forestry (as necessary). Contractor	Weekly Daily
		Soil Erosion and Slippage	As per mitigative measures (a) to (j)	Contractor	MOTWUDLG, MOA. Contractor	Weekly Daily
		Terrestrial and Marine Pollution	As per mitigative measures (a) to (j)	Contractor	MOTWUDLG MOA, MOH. Contractor	Weekly Daily
		Occupational Health and Safety Issues	As per mitigative measures (a) to (j)	Contractor	MOTWUDLG MOA, MOH, MOL. Contractor	Weekly Daily
		Solid and Liquid Waste Management (general)	As per mitigative measures (a) to (m)	Contractor	MOTWUDLG MOA, MOH. Contractor	Weekly Daily
		Solid and Liquid Waste Management (hazardous)	As per mitigative measures (a) to (l)	Contractor	MOTWUDLG MOA, MOH. Contractor	Weekly Daily
		Chance finds and Loss of or damage to Historical and	As per mitigative measures (a)	Contractor	MOTWUDLG, MOA, SVGNT.	Upon discovery

	Cultural Artifacts	to (c)		Contractor	Daily
	Damage to Services	As per mitigative measures (a) to (d)	Contactora	MOTWUDLG, MOA. Contactora	Upon Incident Daily

4.2 Implementation and Monitoring

It is expected that the potential contractors will be required to familiarize themselves with each site prior to bidding for the works, either through group site visits organized by the project team, or individually on their own accord. At that time they will have to acquaint themselves with the potential environmental issues applicable to each site and formulate an approach to address these in conjunction with what is laid out in the EMP. They will be expected to produce specific management plans related to the management of solid and liquid wastes, hazardous chemical management, slope stabilization, site traffic management, etcetera, and have these approved by the relevant agencies and the project's management if awarded the contract.

The Environmental Management plan is to be implemented by all contractors for the various sub projects under the supervision of the project's management team. Any additional measures, consent conditions, or guidelines from the review Agencies that relate to specific project sites must be included in the EMP. These will be reflected as environmental clauses within the works contracts.

In addition to the implementation of the mitigative management measures as part of the EMP, a monitoring program must established over the long term in order to assist in determining of the effectiveness of the project works over time.

Environmental management is a cross sectorial task, and in the context of limited financial and technical resources available, it is expected that the various key Ministries and agencies would collaborate in order to effectively implement the EMP. For example, it is expected that the Ministry of Agriculture and the Ministry of Transport will collaborate to monitor projects and to ensure sustainable environmental management. According to the project's TORs under phase 2, section 4.2.4, the engineering consultant will be required to supervise the contractor, and works undertaken as contractually stipulated. From the point of environmental oversight and to ensure that all required environmental safeguard measures are properly implemented and maintained, as well as those addressing particular issues raised, a **monitoring team** should be established that would be comprised the relevant persons from the main agencies directly responsible for implementation and for environmental management.

Such a team may exercise their monitoring responsibility every two weeks as a routine, visiting each site around the country. Such a team would be led by joint representation of the Chief Engineer's office from the Ministry of Transport and the Ministry of Agriculture, and representatives from the Ministry of Health, Environmental Management Unit, and the Central Planning Department. Additional expertise may be brought in as required based on the impact area.

This does not preclude the **weekly monitoring** programe by key agencies as outlined in the table above.

The Chief Engineer of the Ministry of Transport indicated that the Ministry presently requires that each contractor include, as part of the tender submission, an **Environmental Method Statement**. The Contractor that wins the tender is required to keep an **Environmental Management File** on site and this is reviewed weekly by the Ministry's Environmental Officer, to ensure compliance. These recommendations were part of an EMP, the Mouchel Parkman EMP that the Ministry presently utilizes in relation to road projects as a standard operational document.⁴ It is expected that the measures outlined in that EMP will be read in conjunction with this EMP to ensure a comprehensive approach to environmental site management.

As part of site operations, **the contractor executing the works must monitor the site for the specific impact triggers on a daily basis as part of his or her and their team's normal routine**. The contractor must also maintain an environmental management file, as indicated above, in which he keeps the EMP and all relevant management plans. The file must contain the records of any observations or issues that arise on site during the project works in respect to the works impacts on the environment, date, time, and location. The mitigative actions implemented must also be recorded, along with the duration of the activity, and the resultant effect. This file should also have photographs that substantiate the event and actions.

Post project activity, a scheduled maintenance program of the project product is also important in order to ensure that product fulfills its intended function in good condition over time providing the required benefit to all its target users.

4.3 Contractual Clauses

The mitigative and safe guard measures are presented in a manner that makes them easily incorporated as environmental clauses in the works contract to be issued to the contractor. These measures are expected of all professional contractors who are performing civil works and represent the minimum standard of execution for environmental protection during the execution of the works. The measures outlined in this EMP, along with any conditions or required measures specified by relevant government agencies as a result of routine review and input, or site specific, must be incorporated within the contact clauses.

Appropriate legal wordsmithing will appropriately covert the safe guard measures into applicable legal clauses that holds the contractor legally responsible for the required actions. Such clauses will also facilitate ease of monitoring by the relevant agencies as to whether or not specific actions have or have not been taken as required for any particular environmental issue that arises.

4.3 Corrective Actions

Any corrective actions to be undertaken by the contractor as a result of addressing an environmental concern, must be consistent with the approved site management plan as well as the EMP. All corrective

⁴ The Mouchel Parkman EMP was referred to in email correspondence from the Chief Engineer dated 19 May 2015. The consultant was not able to access or review this document but it is expected that this EMP will be complementary and both serve to ensure responsible environmental management by the contractor (s).

actions must be approved by the implementing agency, project engineer, and relevant government agency.

4.4 Public Information and Communication

One of the best means to combat the negative impacts on the farmers and affected communities is by education. A public education effort will be required as part of the EMP to inform all potentially affected persons and communities with information as to what is to happen, when, and how so that they can be aware. This can be a combination of public service announcements (PSAs) over radio and television, but the most effective would be a community meeting in a hall, local community centre, or park. This should be a government initiative with the contractor present, so that the opportunity is offered to the affected public to raise pertinent issues, and to allow possible solutions or measures to be offered by the agency and contractor. Solutions and measures can also be offered by the very community that will be affected. This communication exercise increases buy in to the project, and allows for a greater tolerance for the expected disturbances.

During the implementation and duration of the project works it is important that all community complaints or issues raised is recorded by the contractor as well as the responsible implementing agency, and that the concerns be addressed immediately. During all of this, the community must be informed that their complaints or issues have been received and are being addressed, as well as providing a tentative timeline for the necessary action. When the necessary action has been completed, the community should be informed, and invited to view the finished result. This facilitates a sense of commitment and trust between the communities and the project proponents, and engenders the atmosphere of a shared responsibility and ownership by the community.

5.0 CONCLUSION AND RECOMMENDATIONS

The following are the main overarching recommendations to be made in relation to the project.

1. All designs must be cogniscent of the existing site conditions, be done to local and international standards, and reflect a green approach.
2. The Environmental Management Plan (EMP) forms part of the Environmental Impact Assessment report and must be read in conjunction.
3. The Environmental Management Plan (EMP) must be implemented as part of the implementation / construction process.
4. The elements of the EMP must be included as environmental clauses within the works contract for the contractor(s).
5. Any other recommendation from relevant agencies, or an applicable EMP already in use, that are in addition to this EIA and EMP, and supports the conscious and responsible management of the environment during the implementation process, should be adopted.
6. The contractor(s) must maintain an Environmental Management File on the respective sites.
7. The contractor(s) must be held legally responsible for the clauses in the EMP and his actions on site and must be penalized for any mismanagement or actions that lead to any negative impact on the environment that he does not immediately address.
8. Regular inspections must be undertaken as part of a scheduled monitoring programme by implementation management team and relevant ministries or agencies.
9. The contractor (s) and their teams executing the works must monitor the site for the specific impact triggers on a daily basis as part of their normal routine.
10. Relevant agencies may also be called as required in to inspect or monitor in the event of an unforeseen or emergency occurrence.
11. A public communication and information strategy must be implemented by the responsible government agencies to inform the affected communities of the proposed works, extent, duration, outputs, and benefits.