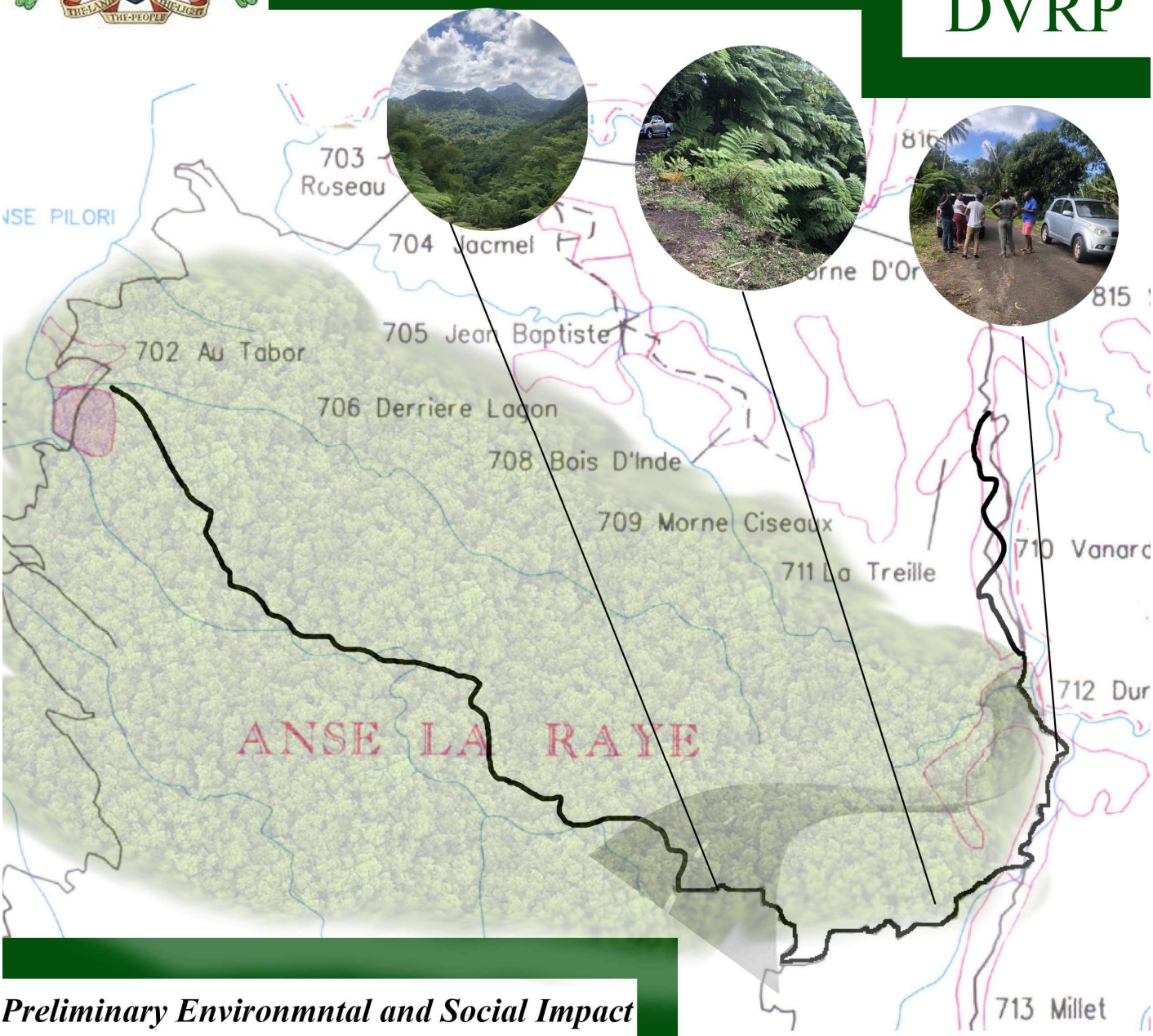
GOVERNMENT OF SAINT LUCIA
MINISTRY OF ECONOMIC DEVELOPMENT
TRANSPORT AND CIVIL AVIATION

DVRP



Preliminary Environmntal and Social Impact Assessment and Environmental and Social Management Plan

Revision
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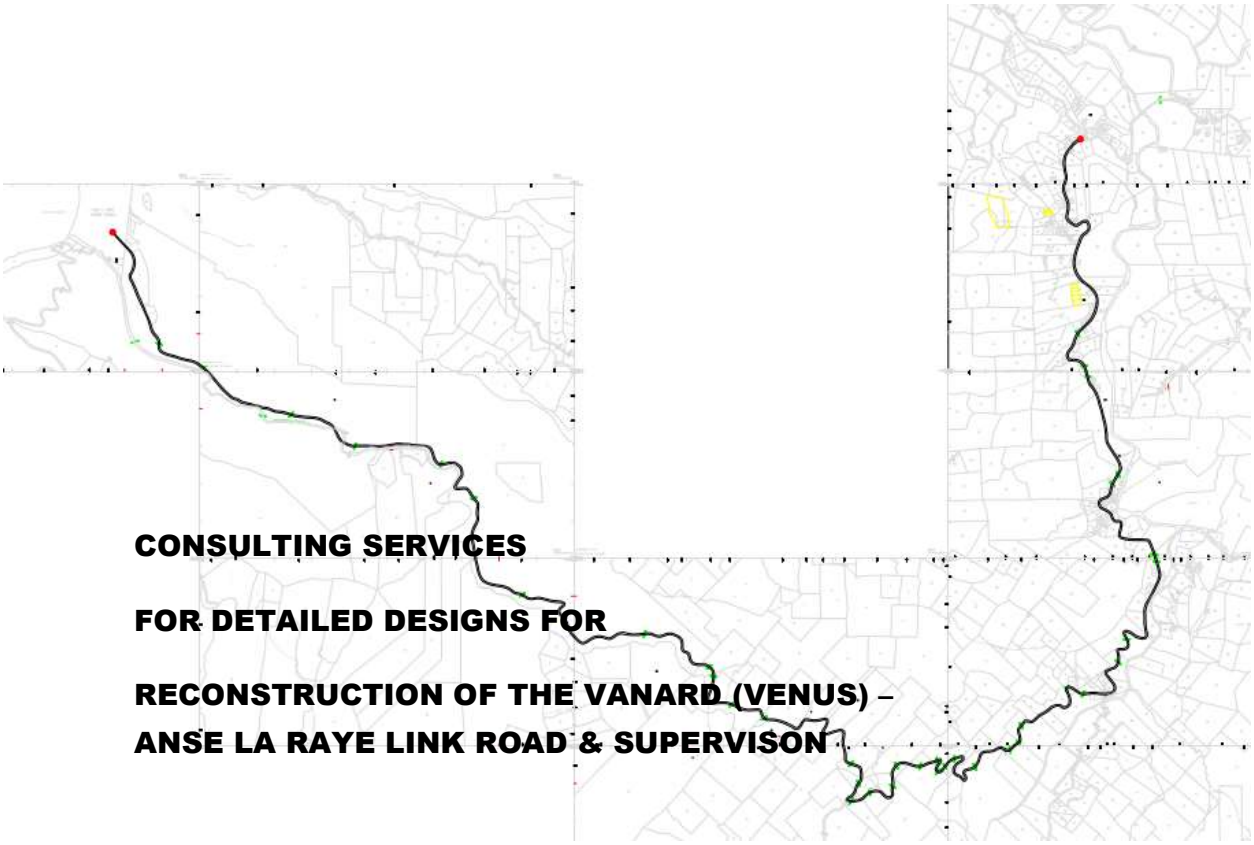
CONSULTING SERVICES
FOR DETAILED DESIGNS FOR
RECONSTRUCTION OF THE VANARD (VENUS) –
ANSE LA RAYE LINK ROAD & SUPERVISON

Submitted By

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LIST OF ACRONYMS AND ABBREVIATIONS

CARPHA	Caribbean Public Health Agency (formerly CEHI) CCE Caribbean Consulting Engineers
CEHI	Caribbean Environmental Health Institute
DCA	Development Control Authority
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
GFLC	George F.L. Charles Airport GOSL Government of Saint Lucia
HIA	Hewanorra International Airport
MAFF	Ministry of Agriculture Forestry and Fisheries
MAFPFRD	Ministry of Agriculture , Food Production, Fisheries, and Rural Development (formerly Ministry of Agriculture Forestry and Fisheries)
MET	Meteorological Services
MFEA	Ministry of Finance & Economic Affairs
MHWHSGR	Ministry of Health, Wellness, Human Services, and Gender Relations
DIPE	Department of Infrastructure, Port and Energy
MOE	Ministry of Education
MOST	Ministry of Social transformation and Local Government
MPDHUR	Ministry of Physical Development, Housing, and Urban Renewal.
MSDEST	Ministry of Sustainable Development, Energy, Science, and Technology
MTLGCE	Ministry of Transformation, Local Government, and Community Empowerment
NEMO	National Emergency Management Organization
OP	Operational Policy
PCU	Project Coordinating Unit
PPS	Physical Planning Section
SDE	Sustainable Development and Environment Unit
SLASPA	Saint Lucia Air and Sea Ports Authority
SLDB	Saint Lucia Development Bank
SLFES	Saint Lucia Fire and Emergency Services SLSWMA Saint Lucia Solid Waste Management Authority
STLNT	Saint Lucia National Trust
WASCO	Water and Sewerage Company Incorporated
WRMA	Water Resources Management Authority

Executive Summary

The existing 12.5 Km Anse La Raye to Vanard (Venus) link road is the main access route between Anse la Raye and the Venus / Vanard communities providing a link between these communities, the agricultural lands owned and farmed by their residents, and heavily forested areas. This tertiary road serves as an eco tourism attraction as well as being the only access to the Water and Sewerage Company Incorporated (WASCO)'s storage tank and secondary treatment plant that services the Anse la Raye region. In 2010, this road, which traverses through hilly terrain and a natural topographic corridor, was severely impacted by Hurricane Tomas resulting in a number of landslides and collapsed sections making this route impassable. Subsequent heavy rainfall events have exacerbated the existing damaged conditions.

The Government of St. Lucia (GOSL) has secured financing under the Disaster Vulnerability Reduction Project (DVRP) from the International Development Association and the Climate Investment Fund to reinstate the road and to incorporate climate change adaptation measures wherever possible, with a view towards upgrading and providing a more resilient roadway infrastructure to service the communities. The Disaster Vulnerability Reduction Project aims to measurably reduce the Country's vulnerability to natural hazards and climate change impacts, and includes various activities related to institutional strengthening and training as well as the execution of various civil works to improve the resilience, preparedness, and response capacity of Saint Lucia to natural hazards. The proposed road project falls under Component 1; Risk Reduction and Adaption Measures of the DVRP which includes financing for the reconstruction and retrofitting of public infrastructure including roads. The Government of Saint Lucia (GOSL) through the Department of Infrastructure, Ports, and Energy (DIPE) will undertake this rehabilitation and reconstruction project spanning a 12 month construction period.

The main components of the proposed project are to be as follows:

1. The extensive upgrading of the existing road,
2. The repair to existing landslides affected areas,
3. The realignment of a short section of roadway,
4. Slope stabilization works which include retaining walls, and
5. The implementation of drainage improvements.

TEAMS Inc. was engaged by the GOSL to undertake the designs for the road project which included undertaking an Environmental and Social Impact Assessment (ESIA) which included an Environmental and Social Impact Management Plan (ESMP). This ESIA and ESMP forms part of the deliverables of the Terms of Reference (ToR), a copy of which is provided in Appendix 1, and reflects an assessment of the social, economic, environmental, health and safety requirements for the upgrading of the Vanard (Venus) Anse La Raye road project. The assessment was based on walk through and study tours of the site along with other data collection methods that also included community consultation. The DIPE provided guidance on the overall project plan for the site, including location of various components

inclusive of the disposal and borrow process, road works, water storage and use, and land accessibility among other things.

As a result of the sensitivity of the natural and human environment and assessed impacts summarised in this chapter. While there are some significant impacts, as detailed in the tables below that are related to rehabilitation and reconstruction of the overall project can be implemented with appropriate mitigation and monitoring measures. In light of these findings looking at site sensitivity, and the varied elements of impacts (nature, type, magnitude) the proposed 12.5 km of existing road infrastructure in the District of Anse La Raye, the Vanard (Venus) – Anse La Raye Link Road is classified as a Category B project.

An estimated 750 residential structures (630 permanent and 120 semi-permanent), 24 commercial structures (14 permanent and 10 semi-permanent) that include 2 places of worship, 1 health centre, 2 day care centres and 1 primary school are adjacent with the route of the road and will be directly affected by the proposed road project. One major Forest system will be affected.

This assessment is guided by and conforms with guidelines on environmental and social impact assessment (ESIA) as provided by the World Bank's Environmental Assessment / Environmental Management Framework. Table 1 below summarizes the specific World Bank Policies that are triggered by the proposed rehabilitation and reconstruction of.12.5 km of existing road infrastructure in the District of Anse La Raye, the Vanard (Venus) – Anse La Raye Link Road.

Table 1 Summary of World Bank's Safeguards Policies triggered by the proposed project

Policy	Objective	Is policy triggered?	Reason for the trigger of this policy
OP/BP 4.01 Environmental Assessment	This policy ensures that Bank-financed projects comply with environmentally sound and sustainable decision-making and mitigate environmental impacts.	Yes	This policy is triggered because of this road rehabilitation project to have potential adverse environmental risks and impacts on its area of influence during the construction and operation phases.
OP/BP 4.04 Natural Habitats	This policy covers land and water areas where most of the original native plant and animal species are still present.	Yes	This policy is triggered because the project has the potential to cause significant loss and degradation of natural habitats during the construction phase.
OP/BP 4.36 Forests	This policy serves to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development and protect the vital local and global environmental services and values of forests.	Yes	This policy is triggered because the project (directly or indirectly) has potential to impact on forest health and quality, rights and welfare of people and their level of dependence upon or interaction with forests during construction and operation phases..

OP/BP 4.12 Involuntary Resettlement	This policy assists in (i) avoiding or minimizing involuntary resettlement where feasible, exploring all viable alternative project designs; (ii) assisting displaced persons in improving their former living standards, income earning capacity, and production levels, or at least in restoring them; (iii) encouraging community participation in planning and implementing resettlement; and (iv) providing assistance to affected people regardless of the legality of land tenure.	Yes	This policy is triggered because the road realignment will likely involve loss of land or other assets resulting in: (i) relocation or loss of shelter; (ii) loss of assets or access to assets during the construction phase.

Table 2 below highlights the sensitivity on the environment by looking at the conditions of the biological, biophysical and human factors that are likely to be impacted as a result of the proposed project activities and identifies the associated impact zones found on the Maps in Fig 59 to Fig 67.

Table 2. Environmental Sensitivity Of BioPhysical and Social Economic Factors

ENVIRONMENTAL SENSITIVITY OF BIOPHYSICAL AND SOCIAL-ECONOMIC FACTORS	Sensitivity of the resource *(low, medium or high)*			Location and Zone of impact *(A – human zone, B-biological (wildlife and flora zone), C-biophysical)*				
Construction Phase	low	medium	high	A		B		C
ENVIRONMENTAL								
Biophysical Factors								
Habitat	X					B		
Terrestrial Fauna			X			B		
Surface Hydrology			X					C[1]
Soils			X					C[1]
Slope Stability			X					C[1]
Aquatic Ecosystems	X							C
Wetlands	X							C
Other Wildlife	X					B		
Landscape Quality	X			A		B		C
Visual Aesthetics	X			A		B		C
Air Quality			X	A[1]		B		
Noise and Vibration		X		A[1]		B		
Solid and Effluent Waste			X	A		B		C
SOCIAL AND ECONOMIC								

Access			X	A		B		C
Local employment			X	A		B		C
Skills development		X		A		B		C
Other economic benefits			X	A		B		C
Resettlement and loss of land and household assets			X	A		B		C

This table identifies potential impacts from the proposed project on human (A-Zone), biological (B-Zone), and (C-Zone) biophysical resources. A-Zone identifies the greatest areas of human impact. Four severity of impact zones are identified. **Zone [1]** is **critical impact zone. Zone [2]**is the zone of **severe adverse impacts** and **Zone [3]** is the lowest impact zone where **possible but less severe impacts** are likely.

Table 3 and 4 highlight the specific impacts that are likely as a result of the proposed project activities. Table 3 outlines the impacts associated with the construction phase and Table 4 depicts potential impacts during the operations phase of the proposed project.

Table 3 Potential Environmental and Social Impacts_Construction phase

POTENTIAL ENVIRONMENT AND SOCIAL IMPACTS	Length of time *(short, medium or long term)* of impact and Nature *(positive or negative)* of impact			Type of impact *(direct or indirect)*		Magnitude of impact
Construction Phase	short	med	long	direct	indirect	
ENVIRONMENTAL IMPACTS						
Biophysical Impacts						
Impact of Habitat Loss		*negative*		*direct*		*Minor*
Impact on Terrestrial Fauna		*negative*		*direct*		*Minor*
Impact on Surface Hydrology and Soil Erosion			negative		*indirect*	*High*
Impact on Aquatic Ecosystems		*negative*			*indirect*	*Minor*
Impact on Wetlands	*negative*				*indirect*	*Minor*
Impact on Wildlife (kills)	*negative*				*indirect*	*Minor*
Impact on Landscape Quality	*negative*			*direct*		*Minor*
Visual Intrusion	*negative*			*direct*		*Minor*
Decreased Air Quality	*negative*			*direct*		*High*
Noise and Vibration Impacts	*negative*			*direct*		*High*
Solid and Effluent Waste		*negative*		*direct*		*High*
Traffic		*negative*		*direct*		*High*
SOCIAL AND ECONOMIC IMPACTS						

Local employment	*positive*			*direct*		*High*
Labour influx		*positive*		*direct*		*Minor*
Skills development	*positive*			*direct*		*Minor*
Other economic benefits	*positive*				*indirect*	*High*
Resettlement and loss of land and household assets	*negative*			*direct*		*Minor*
Involuntary Resettlement	*negative*			*direct*		*Minor*
Health issues (eg respiratory)	*negative*			*direct*		*High*
Impact on Cultural Heritage	*negative*			*direct*		*Minor*
gender participation						
Gender Based Violence	*negative*				*indirect*	*Minor*

POTENTIAL ENVIRONMENT AND SOCIAL IMPACTS	Length of time *(short, medium or long term)* of impact and Nature *(positive or negative)* of impact			Type of impact *(direct or indirect)*		Magnitude of impact
Operational Phase	short	med	long	direct	indirect	
ENVIRONMENTAL IMPACTS						
Biophysical Impacts						
Impact of Habitat Loss	*negative*			direct		Minor
Impact on Terrestrial Fauna			*negative*	direct		Medium
Impact on Surface Hydrology and Soil Erosion			*negative*		indirect	Minor
Impact on Aquatic Ecosystems					-	-
Impact on Wetlands						-
Impact on Wildlife (kills)			*negative*		indirect	Minor
Impact on Landscape Quality			*negative*	direct		Minor
Visual Intrusion	*negative*			direct		Minor
Decreased Air Quality						-
Noise and Vibration Impacts			*negative*	direct		Minor
Solid and Effluent Waste			*negative*	direct		Minor
SOCIAL AND ECONOMIC IMPACTS						
Access			*positive*	direct		High
Local employment			*positive*		indirect	High

Skills development			*positive*		indirect	Minor
Other economic benefits			*positive*		indirect	High

Table 4 potential impacts with the operations phase of the proposed project

The measures outlined within this ESIA and the ESMP must be implemented by the contractor in all of the project activities including mobilization and demobilization to ensure that the project is a net benefit activity and that the local physical and social environment is not adversely affected by the project.

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SECTION 1

Proposed Vanard Venus Anse La Raye Road, Quarter of Anse La Raye, St. Lucia.

1.0 Introduction

The Government of St. Lucia (GOSL) has secured financing towards the implementation of the Disaster Vulnerability Reduction Project (DVRP) from the International Development Association and the Climate Investment Fund. The Disaster Vulnerability Reduction Project aims to measurably reduce the Country's vulnerability to natural hazards and climate change impacts, and includes various activities related to institutional strengthening and training as well as the execution of various civil works to improve the resilience, preparedness, and response capacity of Saint Lucia to natural hazards.

The GOSL, through the Department of Infrastructure, Ports, and Energy is seeking to undertake the rehabilitation and reconstruction of.75 km of existing road infrastructure in the District of Anse La Raye, the Vanard (Venus) – Anse La Raye Link Road; with a view to significantly improve the quality of that road. The proposed road project falls under Component 1; Risk Reduction and Adaption Measures of the DVRP which includes financing for the reconstruction and retrofitting of public infrastructure including roads. Figure 1 below provides a general location of the project area and the road within Anse la Raye.

In undertaking this Road Rehabilitation Project, the GOSL seeks to fulfill its mandate in improving the motorability, general conditions and resilience of the existing roadway. The deteriorating condition of this road network results in exorbitant vehicular operating costs to farmers, and residents with certain sections have become inaccessible.

TEAMS Inc. was engaged by the GOSL to undertake the designs for the road project which includes undertaking of an. Environmental and Social Impact Assessment (ESIA). The ESIA forms the deliverances of the Terms of Reference (ToR), a copy of which is in Appendix 1. The Environmental and Social Impact Assessment (ESIA) reflects an assessment of the social, economic, environmental, health and

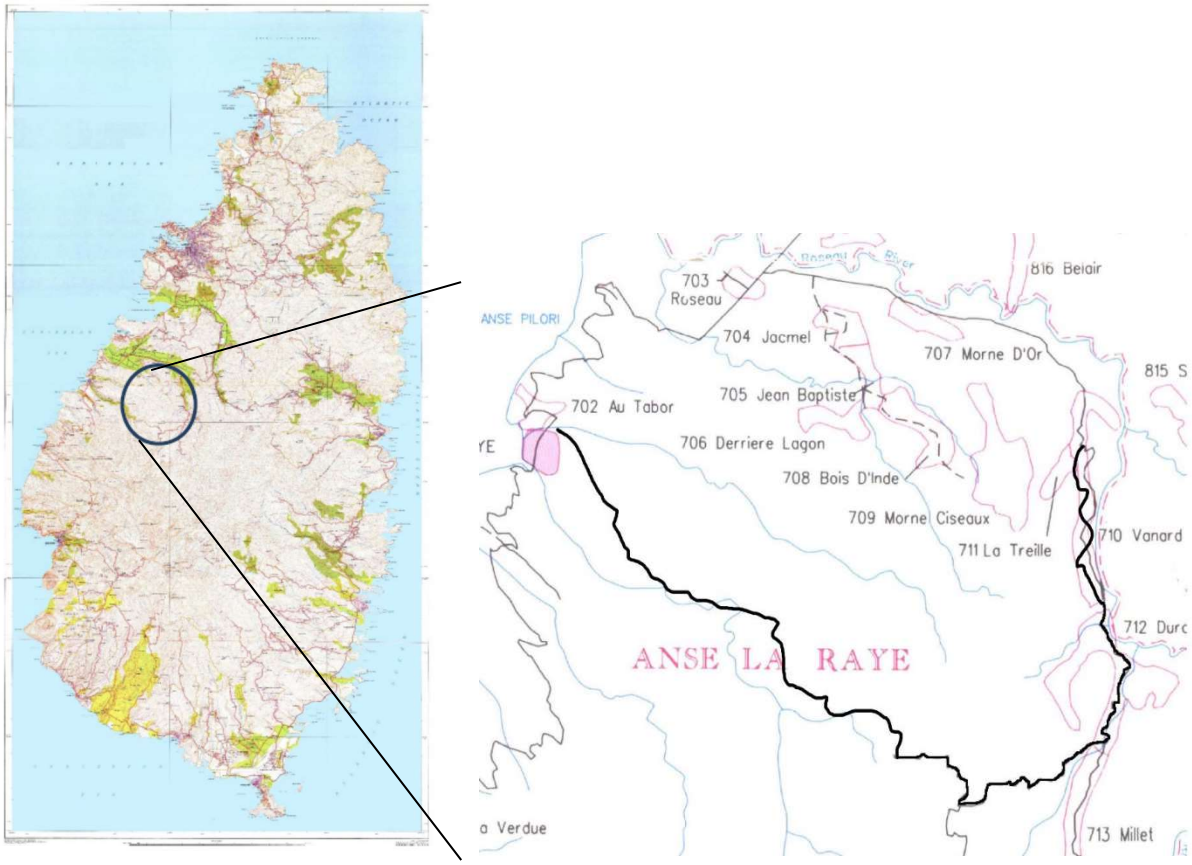

Figure 1. Location of Project Road in Anse la Raye

safety requirements for the upgrading of the Vanard (Venus) Anse La Raye, Quarter of Anse La Raye, St Lucia. The assessment was based on a walk through and study tours of the general area under consideration as well as other data collection methods as outlined below.

1.1 Scope of Work and Methodology.

The TOR for this EIA are contained in **Appendix 1**. The DIPE provided guidance on his overall project plan for the site including location of various components inclusive of the disposal and borrow process, road works, water storage and use, and land accessibility among other things. The project concept is presented in Section 1.3 below.

1.2 General Methodology

The focus of the methodological approaches included the following:

1. Team exercises-among the members of the consultancy team relating to discussions surrounding shared activities.

2. Detailed scoping assessment of the road corridor and its surrounding influence area to establish the existing baseline conditions. This included stakeholder consultation and social surveys of the community members that may be impacted by the proposed works

3. Literature review of population and statistics, agricultural census and fisheries records, geographical data, policies, laws, development guidelines and standards, marine studies, Historical records among others;

4. Research of precedents regarding road construction in Saint Lucia;

5. Technical consultation (one on one) with government Ministries and agencies including the utility companies

6. Internet research and historical records, land register and files and media;

7. Developed a list of community stakeholders with assistance from the Ministry of Social Transformation and the Community office to comprehensively cover community based group, economic groups and individuals; Stakeholders that have been consulted during the ESIA include

    a. Community within the project area

    b. Statistics Department

    c. Ministry of Social Transformation, Local Government and Community Empowerment Department of Economic Development

    d. Department of Infrastructure Ports and Energy

    e. St Lucia Water and Sewerage Authority

    f. Department of Environmental Health

g. Anse La Raye 1987 All Stars

h. Anse LA Raye Foundation Sports Club

i. Anse La Raye Vendors Association

j. Anse La Raye Minibus Associatiom

k. Island Adventures Co. Ltd

l. Millet Primary School

m. West Coast Communities Co-operative Credit Union Society Ltd.

n. Tropical Farms Supplies Ltd.

8. Undertook structured sample surveys of community stakeholders. This qualitative approach was employed to provide in depth and contextualized insights of stakeholder perceptions on the potential benefits of the project; real and anticipated threats of the project on their livelihood and community along with measures to improve and mitigate such impacts;

9. A review of perspectives of stakeholders who use the area's environmental resources to support their livelihoods

10. One on One and small group meeting with community members and stakeholders fishers, tour establishments, local establishments around the site, locally based public services e.g. school principals, community nurses etc., economic organizations, botanists and others with site knowledge;

11. The assessment of the flora involved a walk-around field study, and the use of the consultant team's prior studies and available literature;

12. The Wildlife assessment involved walks along existing access road within the inventory area covering of the site. Observations were made twice per day, 5.30 a.m. to 10 a.m. and 3.00 p.m. to 6:30 p.m., the most active time of day for wild animals. The presence of species observed and heard was recorded and photographed.

The activities carried out through the ESIA process provide key information that feeds into the design process and will assist with the selection of the most appropriate solution that will minimize potential negative environmental and social impacts, and will provide inputs to the ESMP

The ESIA, ESMP and the methodology are also guided by the Environmental Management Framework of the DVRP that provided the guidance that a specific focused EIA may be required for the Venus - Anse La Raye Road and would require screening[1]. The DVRP's EMF indicated that the site is classified as a sensitive area, should there be endemic wild life such as snakes present in the area and that the forest aress most likely represent Natural Habitat and so it is possible that additional assessment studies would need to be conducted (most likely in the form of a specific EIA) and a more detailed EMP would need to be developed with conditions applicable to the works

1.3 Objectives of the ESIA

This report fulfills the requirement of the Terms of Reference to undertake an ESIA to address the potential impacts on the Vanard Venus Anse La Raye road, as outlined in the DVRP Environmental Assessment and Environmental Management Framework and Mitigation Measures, in the DVRP Social Assessment, and the Resettlement Policy Framework. The ESIA is required, along with an ESMP, to identify potential environmental and social impacts and to provide guidance on the mitigation measures that are to be implemented as a component of the Project

The ESIA and ESMP addresses the relevant World Bank Operational Guidelines and Policies that are applicable, such as World Bank Operational Policy 4.12 and those for working within forested areas or Forest Reserve.

[1] Disaster Vulnerability Reduction Project (DVRP), Environmental Assessment (Ea) & Environmental Management Framework (EMF) by Heholt (2013), and updated by PCU (2013 &2016).

The Environmental and Social Management Plan (ESMP) will be developed based on the findings of the ESIA. The ESMP is required to clearly describe the mitigation measures, responsibilities, supervision arrangements, and reporting requirements for the contractor, the supervision firm, and the PCU during the implementation stages of the road project. The report will also address the potential impact on private property, likelihood of displacement of livelihoods and of affected persons, potential damage to crops as well as the potential social or economic benefit, possible land take for the purposes of construction for temporary or permanent use and to facilitate compensation for acquisition of private property

1.4 Project Details

The GOSL seeks to rehabilitate 12.5 km of road in the District of Anse La Raye, the Vanard (Venus) – Anse La Raye Link Road; with a view to significantly improve the quality of the roadway for general road users and the communities served by that road. This tertiary road serves as (a) the only connection between the two communities, (b) main access route between the residential community and the Anse la Raye Primary School, and (c) only access to a WASCO storage tank and secondary treatment plant.

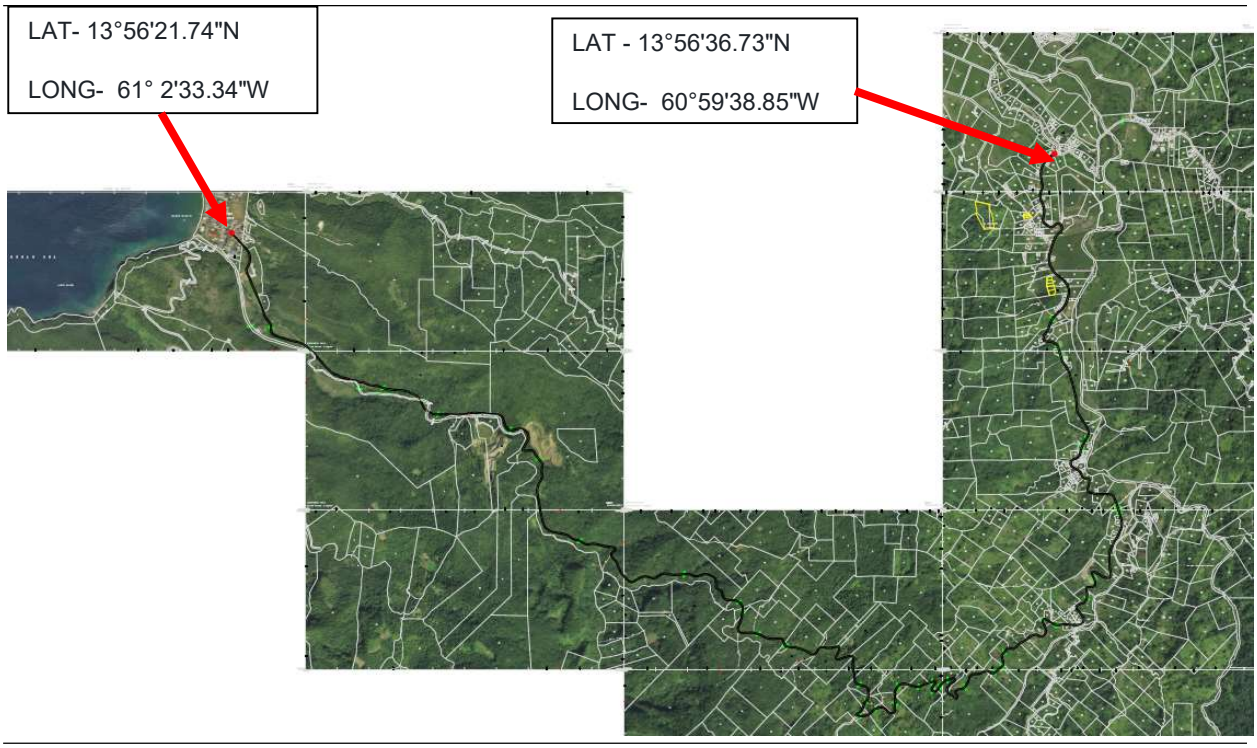

Figure 2 Route of the proposed road

The objective is to reinstate the road and incorporate climate change adaptation measures wherever possible, building-back better and more resilient roadway infrastructure provision and upgrading of access for pedestrians including cyclists, tourist viewpoints, bus stops and laybys

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1.4.1 Outline of Project

The project is to upgrade an existing road that links the Vanard, Venus and Anse La Raye communities via an inland route. This road traverses through mainly agriculturally based communities and also served as an eco-tour attraction for tourist but was damaged after the passage of Hurricane TOMAS in 2010. The road has also suffered significant damage from two major landslides due to rainfall events over the past ten (10) years as well. As a result, the road became impassable to motor vehicles. Continued soil

erosion, unstable slopes and the silting of the drainage systems have contributed to the increased risk during the rainy season and will be fully considered in project design and works

1.4.2 Route Description

The road follows the Vanard to Venus to Anse La Raye road corridor and traverses through a small built up section of mixed use lands through the Derandeau area and onward through the dense natural vegetation characteristic of a tropical forested area between Venus and Anse la Raye village. There are about 750 houses along this route that will be in direct contact at some point during the reconstruction that is proposed to the road. The road traverses the watershed of the Roseau river and one can observe the slopes created by mountain rises that are steep with cuts that appear unstable. Some sections of the road are narrow and slippery within the hilly areas. When exposed these slopes are susceptible to landslide. A number of site photos of the route are displayed within Appendix 3 for refence.

Forest cover is generally quite complete and vegetation lush; apart from the lowest part of the valley which has been cleared for housing and agriculture and where there are quarries. Small gardens are also found close to the road with rather more intensive farming closer to Venus.

The main access from the road project is via Roseau along the West Coast road and through to it's junction with Vanard and Sarrot (Chainage 0+00). About 4 Km of the road follows a relatively flat vertical but winding horizontal alignment until the Venus area where the steep elevations commence. As one traverses the flat part of the road from the start chainage, the Roseau river can be observed to the left with its water level varying between 6 to 8 metres below the road surface. The road passes through agricultural plots with patches of residences for most of its winding horizontal alignment.

The area through which the road traverses can be differentiated as follows

Vanard – Venus Junction road section is located between chainage 0+00 and 5+000 and traverses the community of Derandeau. The majority of the residents about 750 houses of the community are found in this section of the road. This section also serves the Caico community and the Millet community where

the John Compton Dam is located. The road surface is mostly asphalt with potholes and rutting and the largest amount of human receptors can be found here. Road realignment will be required in this section.

Venus Junction to WASCO water works. This section covers the route through chainage 5+000 to chainage 9+000 the rain forest and contains larger plots of agricultural and less than a dozen houses. This section contains the most biodiversity and contains the eco-tourism trail and sightseeing locations. Road realignment will be required in this section. The road surface is asphaltic with small concrete sections.

This section from chainage 9+000 to 12+500, traverses from the WASCO water works to the Village of Anse La Raye and has the widest the road surface is generally unpaved up to chainage 12+000 at the Anse La Raye primary school. There is asphaltic paved surface from the school to the village main road.

1.4.3 Project Components

The main components of the proposed project are as follows:

6. The extensive upgrading of the existing road,
7. The repair to existing landslides affected areas,
8. The realignment of a short section of roadway,
9. Slope stabilization works which include retaining walls, and
10. Drainage improvements.

1.4.4 Duration of Works

The project is expected to require 16 man months for the detailed design work and 12 months for the construction work.

1.5 Design Considerations

The design for this road rehabilitation has been undertaken by qualified engineering consultants following the standard and required international, regional, and local engineering codes and requirements. All necessary calculation, factor of safety considerations, and design simulations for

drains, retaining walls, and other components were supposed to have been completed. The existing right of way of the Anse la Raye to Venus road was initially designed and constructed by the Ministry of Infrastructure with a 7.5 m carriageway which is standard for rural roads in St. Lucia. According to the project engineers, this has not been exceeded in the designs produced for any of the location within the project.

Manning's formular was used to design and size drainage channels. The data used for drain sizing and a sample of the several calculations are provided with the detailed designs in a separate report. Culverts will be installed in two sections. This means that during construction only one side of the road will be available for traffic flow. Flagmen and amber warning lights will be used for traffic control. The inlet will be blocked and water moved by a pumping system to the culvert outlet.

The proposal for retaining walls at various points considered slope, presence of any water courses and the requirement to avoid the need for land acquisition that would be necessary with a realignment of the roadway as much as possible. The measures designed following investigation and study include new lined drains and cross culvert at the required locations to allow for adequate flow of water. The cause of the erosion within the site was saturation of soils from Hurricane Tomas. This has been verified by investigations conducted by the project engineers which include field observations, geotechnical analysis of each situation and slope stability calculations. Erosion and slope instability problem are critical factors that could continue to advance and extend to and adversely affect the proposed new road. The proposed design measures will include a new lined drain, and cross culvert at the relevant location. Additionally, new lined drains are being built at the road locations before and after this area which will allow for flow of water which is acritical consideration.

It must be noted that the realignments are not designed specifically to escape unstable areas. **The mitigation measures proposed are to reinstate carriageway width from areas eroded during the passage of Hurricane Tomas**. The Consultant along with DIPE have concluded that the slopes along the road are presently stable with no observed movement prior to Hurricane Tomas and none in the past ten years subsequent to passage of the hurricane. The realignment was chosen as the most cost effective method to restore the carriageway width.

The engineering consultants have indicated that the proposed designs produced for this project are such that there is no need for any realignment to avoid or give consideration to existing overhanging branches.

Designs such as drains are designed with greater capacity than needed. Pavements are to be similar to those existing in St. Lucia which have proven to be resilient in areas of high vegetative growth. The designs are tried and proven in St. Lucia.

While traditionally on similar works such features as specific work areas, laydown, storage yards, or other sorts of ancillary work areas have been implemented, while these are not anticipated for this project, it does not preclude the setting up as the situation may require. The rationale is to minimize setup cost, contractors operate from their base of operations and with materials and equipment being transported to the site as necessary.

There is no plan to dispose of any waste material onsite. Waste material will be brought to the Deglos Landfill in Cul de Sac managed by the Saint Lucia Solid Waste Management Authority for disposal. Any excavated material or stockpiles will be immediately stabilized by repose sloping or surrounding with geotextile or silt curtains to assist in preventing landslides, erosion, or sedimented runoff that will negatively affect the water quality of nearby streams. Cut vegetation will carted away or offered to local persons for their use in the making of charcoal or fencing.

Raw material for the works such as aggregate and fines will be sourced from privately licensed commercial quarries which operate under the relevant legislation in St. Lucia and who can provide the required material to the technical design standards required. Contractors will purchase material from these quarries under the same conditions that exist for the rest of the public. It is expected that the national licensing authorities are ensuring that these commercial quarries adhere to legislation and environmental and health requirements. There are no plans to have quarries opened specifically for the project.

Technical Specification and Maintenance Plans will be included in the final technical report to be produced and submitted to the client by the engineering consultants to guide the contractor and ensure optimum standard of work is achieved. It is expected that following the completion of the road, the DIPE will be ensure that the necessary maintenance is undertaken to ensure its longevity. This will mean the inclusion of the necessary works within their Department's maintenance Programe.

1.6 Sector Goals

The project contributes to the development of the Vanard Venus Anse La Raye road that ends in the village in Anse La Raye and for the GOSL to fulfill its mandate in improving the motorability, general conditions and resilience of the existing roadway. The DIPE aims to provide adequate redundancy in the road network and to promote alternative route travel in the event it becomes necessary. The project will contribute to an overall improvement in resilience to extreme weather events of the critical road links along the west coast of the island. Figure 3 shows the relevancy of important issues and road development plans within the National Development Plan with this project. The project is intended to achieve the following goals.

1.7 Project Goals and Relation with National Development Plan

The following indicates the relevance between the project and the national development goals.

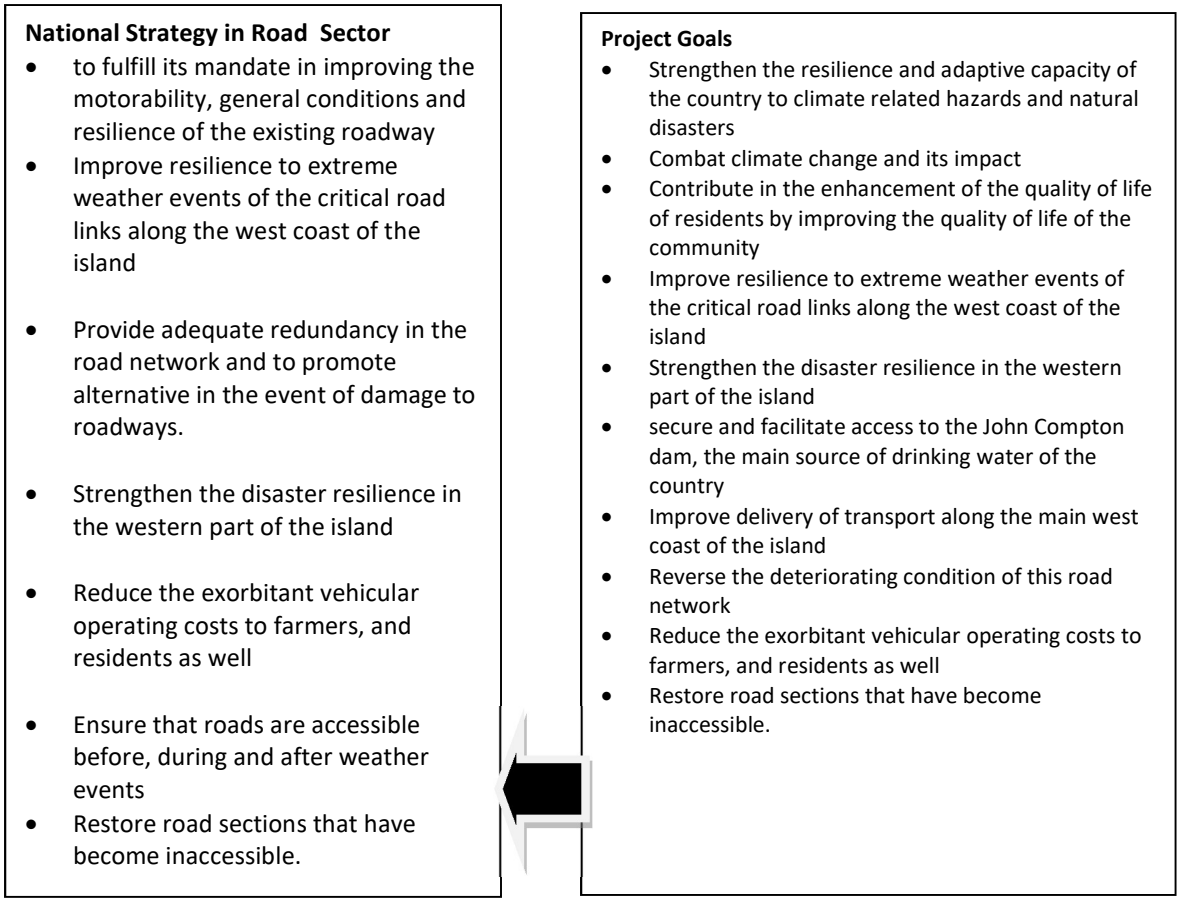


Figure 3 Relevance of Project Goals with National Development Plan

1.8 Project Outputs

The expected outputs of the project are as follows:

- Preparation of detailed engineering designs for the rehabilitation/reconstruction of the Vanard (Venus) to Anse La Raye Link Road and
- provides an alternate access for commuters between the two communities (Millet and Anse Lan Raye
- Road designed and constructed to withstand weather related phenomena and is resilient to the effects of climate change

Figure 4 Clearing of road alignment to commence surveys

Appendix 3 provides some photographs of the road condition for additional reference.

SECTION 2

Administrative and Legislative Considerations Underpinning the Conduct of the Environmental and Social Impact Assessment

2.0 Existing Planning And Environmental Legislations

There are a number of Government and statutory agencies with responsibility for environmental management under various pieces of legislation. The Department of Infrastructure Ports and Energy (DIPE) has the main responsibility for roads and settlements. Saint Lucia has no unified Environmental Legislation. Environmental legislation relating to environmental protection, conservation, management and the control of development fall under the statutory authority of various agencies of Government.

The principal legislation guiding the requirement for the EIA is the revised Physical **Planning and Development Act No. 29 of 2001**. The Act guides the **Development Control Authority (DCA)** in its deliberations and the **Physical Planning Section** of the Ministry of Physical Development which is the executive secretariat of the Development Control Authority. While the Fourth Schedule of the Act identifies the types of development for which an EIA is required, the Board of the Development Control Authority can also determine that a particular type of development may require an EIA based on certain characteristics of the proposal and the determination that there may be potential impacts that need to be considered and mitigated.

With regard the road proposal, a number of other pieces of legislation and International Environmental Agreements have implications for sound environmental management and protection of natural/water resource in St. Lucia either tangentially or directly (**See Table 4 below**). Also, there have been established national policies which have implications for the conduct of the proposed project. A brief synopsis of some of the key pieces of legislation, international environmental agreements ratified by the Government of Saint Lucia and relevant national polices are presented in the table below.

Table 1 Principal Legislative Instruments That May Be of Relevance to roads In St. Lucia

Legislation	Authority
Agriculture Small Tenancy Act 1983 (No.22 of 1983)	Enforces regulations requiring sound soil and water conservation practices on smallholder lands and agricultural holdings
Forest, Soil and Water Conservation Ordinance Cap 25 1946. (Amendment) 1957, 1983	Provides for the conservation of forest, soil and water resources; management of forest; establishes forest reserves and protected forests; and soil and water conservation programmes in protect forested areas
Land Conservation Improvement Act 1992 (No. 10 of 1992)	Provides for better conservation and improvements in land and water resources drainage
Physical Planning and Development Act (No. 29 of 2001)	Ensures that appropriate and sustainable use of all land, provides for the orderly sub-division of land, and; protects and conserves the natural and cultural heritage of Saint Lucia. It governs (i) preparation of physical plans, (ii) development control and regulation, (iii) environmental impact assessment and (iv) miscellaneous matters related to development.
National Conservation Authority Act (1999)	Established the National Conservation Authority; manages beaches and public spaces; able to declare areas of land or water as protected areas.
Public Health Act 1975 (No. 8 of 1975)	Regulatory oversight for sewage, industrial and solid waste disposal; and removal of nuisance and insanitary conditions on premises (rubbish, night soil, etc.)
Pesticides and Toxic Chemicals Control Act (2001)	Provides a comprehensive framework for the safe management of pesticides and other harmful chemicals; ensures plant health, and human and animal health and safety
St. Lucia National Trust Act 1975 (No. 16 of 1975)	Provides for the preservation of buildings and objects of historic and architectural value and areas of natural or scenic importance
Waste Management Act (2004)	Establishes the National Solid Waste Management Authority
Town and Country Planning Ordinance Cap 175, 1946 and amended	Physical planning and building control
Water and Sewerage Act (2005)	Regulates the granting of licenses development and control of water supply and sewerage facilities and related matters; designation of water and waste control areas

Legislation	Authority
International Environmental Agreements	
Convention on Biological Diversity (1992); ratified by St. Lucia in 1993	
Protocol Concerning Pollution from Land-based Sources and Activities to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean (1986)	
Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter (1985)	
Protocol Concerning Specially Protected Areas and Wildlife to the Convention for the Protection and Development of the Marine environment of the Wider Caribbean (1990).	

2.1 The Physical Planning and Development Control Act, No. 29, 2001

The Physical Planning and Development Control Act No. 29, 2001 makes provision for the regulation and control of the development of land, environmental impact assessment along with enforcement, compliance monitoring and other powers.

The key objects of the Act are: - to ensure that appropriate and sustainable use is made of all publicly and privately owned land; to maintain and improve the physical environment; provide for the orderly sub-division of land and the provision of infrastructure and services; to maintain and improve building construction standards to secure human health and safety, and protect the natural and cultural heritage of Saint Lucia.

2.2 The Physical Planning and Development Control Act is administered by the Development Control Authority with the Department of Physical Planning as its secretariat. Under Section 16, development over which the Physical Planning and Development Act can exercise control is defined as follows:- 'the carrying out of building, engineering, mining or other operations in, on, over or under any land ….the laying out of roads, the laying of water pipes, the clearing of or levelling of land, the filling of ravines or swamps, the construction of any building or any preparatory work which might indicate an intention thereby to improve the land or increase its value or make it in any way ready for any type of development'. Section 17 and Schedule II outlines permitted development or development exempt from Planning Control and is presented in Appendix 2 of this report for reference (Refer to Appendix 2).

The Act supports the objectives of environmental conservation and preservation in three (3) main provisions: Provision for Plan Making (Part 2); Control of Development and the declaration of environmental zones (Section 32, 34, Part 3). The mandatory need for Environmental Impact Assessment (EIA) Section 22 PART 2 and Schedule 4 along with an Environmental Monitoring Plan.Schedule 4 of the Physical Planning and Development Act, lists classes of applications for which an EIA is ordinarily required.

Under the Physical Planning and Development Control Act, the quality and engineering safety of construction is guided by the Caribbean Unified Building Code (CuBIC). Physical Development is guided by the standard specifications of the Ministry of Infrastructure (road, electrical installation including buildings and drainage), the Water and Sewage Company (water supply), the Department of Health (sewage liquid waste disposal) and approval of the Fire Department for Fire Prevention Measures.

2.2.1 Planning Approval of the Proposed Project

It must be noted here that applications for yarious types of development must be submitted to the Development Control Authority where they are reviewed by the Department of Physical Planning who then presents their assessment to the DCA along with a recommendation to approve or not. Approvals are valid for one year and may be issued with conditions which are monitored by a team of building officers. Schedule 3 relating to Section 18 of the Planning Act list the developments that are considered "Permitted Development" which **do not require Planning Approval**. This road project is considered as such with subsection (e) of Schedule 3 which would define such works as " repair to service". Nonetheless, such works will be subject to constant monitoring by the Department of Infrastructure and still routinely by the DCA's Building Officer for that zone or area.

2.3 WildLife Act, No.9, 1980 (with revisions in 2001) Cap 6.03

This Act makes provision for the protection, conservation and management of wildlife in Saint Lucia. Wildlife except for fish, frogs and crustaceans in private ponds are the property of the Crown. The Chief Wildlife Officer under the Act has the power to declare an area of land or water or territorial sea to be a wildlife Reserve. Wildlife areas can be established through leases, exchanges, or buying/selling any

property for use as a wildlife reserve. The classes of protection are protected, partially protected wildlife, unprotected wildlife, as specified in Schedule 3.

2.4 Forest, Soil and Water Conservation Ordinance (Cap 25 of 1946) The Forest, Soil and Water Conservation Ordinance (Cap 25 of 1946) provides for the conservation of forests including dry forests and wetlands, soil and water resources. The Act provides for the establishment of protected forests on public and private lands. For private land the Act makes provision for a system of compensation and an outlined process for administration by the Chief Forestry Officer.

2.5 Land Conservation and Improvement Act (Cap 5.10)

The Act provides for making protection orders for conservation and improvement of land and water and can work in tandem with the Forest, Soil and Water Conservation Act (2008). The Act establishes a Land Conservation Board falling under the Ministry of Agriculture to deal with the specific issues of degradation, pollution and water conservation.

2.6 The National Conservation Act (Cap 6.01)

This Act establishes a National Conservation Authority to, inter alia, conserve the natural beauty and topographic features of Saint Lucia through the control, maintenance and development of beach or protected area, areas of public access to a beach or protected area.

2.7 Water and Sewerage Act (Cap 8.14)

The Water Resources Management Agency (WRMA) is established under the Act for the management of water resources to ensure the sustainability of the water resources. The WRMA issues abstraction licenses based on hydrological and hydrogeology and other factors as well as licenses to discharge waste (liquid and sewage.)

Under sections 23 and 24 provision is made for declaring Water Control Areas for the purposes of the regulation of water use or classes of use and Waste Control Areas to regulate the discharge of waste

water (onto land, sewer or drain, bore or in water) for the purposes of protecting water resources from pollution and protecting flora, fauna of water courses. Under the Act the Minister may take action to prevent polluting matter from entering water, or remove and dispose of polluting matter to remedy or mitigate any pollution.

WASCO provides public potable water for domestic purposes, public sewers and sewage disposal works, in compliance with public health laws and in accordance with water abstraction and waste discharge licenses.

2.8 Fisheries Act (Cap 7.15)

This Act provides for the control and regulation of marine fishing in Saint Lucia. Under the Act the Minister may declare any fishery water, and surrounding land, as a marine reserve, for the purposes of protecting flora including mangroves and wetland vegetation, fauna, natural breeding grounds, areas of natural beauty, areas for research and habitats of aquatic life. The Act is supported by Fisheries Regulations (No. 9 of 1994) which establish conservation measures for the protection of turtles, sea urchins among others. Pollution of the marine environment through direct or indirect disposal of waste (solid, sewage or liquid) is strictly prohibited.

Permission is required for use of marine reserve and activities such as fishing, construction, dredging, discharging waste water, and taking or destroying flora and fauna are strictly prohibited. Permission may be granted upon application for research activities in such areas.

2.8 Crown Lands Ordinance Cap 5.02 and Regulations

This Act provides for the management of Crown Lands, including unallocated Crown lands and vacant lands and the acquisition and divestment of lands by the state. This Act is administered by the Crown Lands Department of the Department of Physical Development.

2.9 Saint Lucia National Trust Act (Cap 6.02)

The Saint Lucia National Trust Act of 1975 established the Saint Lucia National Trust, which is a membership organization set up to help preserve the natural and cultural heritage of Saint Lucia including the acquisition of interest in properties through the receipt of vested properties from the state or donations from private land owners, and also through the purchase or lease of properties. The objectives of the Saint Lucia National Trust include the listing of buildings, objects and monuments of prehistoric, historic and architectural interest, and places of natural beauty (land, marine and subterranean).

2.10 The Waste Management Act (No. 8 of 2004)

The Waste Management Act regulates waste management in Saint Lucia to ensure good public health standards and reduce the harmful effects of pollution on human health among others. The Act provides for the establishment of the Solid Waste and makes provision for the management of waste management facilities, domestic, industrial, medical, ship and hazardous waste. The Act prohibits unauthorized disposal of waste including silt, construction and demolition waste in any land, river or river bank and the disposal of any waste in a manner which can cause pollution or negatively impact human health.

It also prohibits the construction or operation of unlicensed waste management facilities and the SWMA issues waste haulage licenses to private haulers who meet certain prescribed minimum standards and minimum training requirements. Liability for spills and malpractice is borne by the hauler who is managed by the SWMA. Under the Act, waste management plans are required as part of planning applications. Standard data such as estimated quantities of waste to be generated in pre-construction, construction and operational phases of the project needs to be provided. Actions to minimize waste generation and maximize reuse, recycling and composting are identified and encouraged especially for large commercial generators of waste. A specific management plan is required for any hazardous waste that may be generated.

2.11 The Public Health Act (Cap 11.01)

The Act provides for the promotion and preservation of the health of the inhabitants of Saint Lucia through inter alia, the prevention, treatment, limitation and suppression of disease; abatement of

nuisances and removal or correction of any condition injurious to public health; control of food and drugs in the interest of the public health. With powers under the Act, the Minister can make regulations for a number of areas falling under the Act including Nuisances such as dust and noise, Water Quality Control, Sewage and Disposal of Sewage, Disposal of Liquid waste, Industrial Waste, Works, Disposal of Offensive Matter, Food and Food Handling Regulations and Mosquito and Vector Control, among other areas.

2.12 Disaster Preparedness and Response Act (Cap 16.06)

The main purpose of the Act is for effective disaster management: - the organization of the mitigation, preparedness and response to and recovery from emergencies and natural and manmade disasters.

2.13 Saint Lucia Labour Code

The Labour Code outlines a comprehensive set of guidelines for the conduct of labour relations for employer and employee. Of relevance to the proposed development even at the construction stage of the development is Part IV of the Code which relates to Occupational Health and Safety. This section of the Act provides for inter alia, instructions on use of machines, protective clothing and devices, staff facilities, fumes, cleanliness, waste disposal, noise, lighting, ventilation, fire safety, first aid, medical examinations and regulations for medical supervision, reporting and handling of accidents and occupational diseases; use of hazardous chemicals and biological agents among others.

2.14 Employees (Occupational Health and Safety) Act No 10 of 1985

The Employees (Occupational Health and Safety) Act No 10 of 1985 sets standards for occupational health and safety in places of employment, and requires employers to, as far as practicable, maintain work conditions that are safe and without risk of injury to health, provide safe means of access and egress, ensure risks of injury or accident do not arise from the handling, storage, transport, use or disposal of dangerous substances, provide information, training, supervision, protective clothing and first aid facilities to ensure employee protection. Employees are required to take reasonable care, cooperate with the employer in carrying out the provisions of the Act, not tamper with safety devices, ensure that

risks do not arise in the handling, storage, transport, use or disposal of dangerous substances, properly use and care or protective clothing, report defects which may cause accident or injury, and report accidents or injuries to his immediate supervisor. The Act provides for disposal of wastes and effluents, ventilation, drinking water, latrines and urinals, first aid appliances, medical examination, notification of accidents and dangerous occurrence, guarding of machinery, training and supervision of operators, toxic substances, work in confined spaces, personal protective equipment and protective tools, protection of eyes and precautions in case of fire.

2.15 Equality of Opportunity and Treatment in Employment and Occupation Act No 9 of 2000

The Equality of Opportunity and Treatment in Employment and Occupation Act no.9 of 2000 provides legal protection against discrimination in the workplace on the grounds of race, sex, religion, colour, ethnic origin, family responsibilities, pregnancy, marital status, or age. The Act makes provision for equal remuneration for men and women performing work of equal value. The Act also makes provisions for the offence of sexual harassment in the workplace

2.16 Land Acquisition Act No. 12 of 1945 Amended by Act no.11 of 2000

The Land Acquisition Act No.12 of 1945 Amended by Act 11 of 2000 is legislation that guides the Government's compulsory acquisition process for any lands deemed necessary to accommodate the provision of service access and necessary works. The Authorized Officer to execute the surveying and acquisition of the required properties is the Chief Surveyor of the Survey and Mapping Department of the Department of Physical Planning in the Ministry of Agriculture.

2.17 Criminal Code, No. 9 of 2004 (Effective 1 January 2005) (Amendment) Act 2006 (No. 38 of 2006).

The Saint Lucia Criminal Code is a code of criminal offences and procedure prepared under the authority of the **Criminal law** and procedure ordinance. It attempts to address all genders in the case of violence and other offences buy may be considered discriminatory in some of its sexually related offences.

2.18 Multilateral Environmental Conventions & Agreements

Saint Lucia has adopted policy measures as it relates to international agreements and convention and is committed to achieving its goals and objectives in Disaster Risk Management through its commitment to

the three Rio conventions namely United Nations Convention to Combat Desertification (UNCCD), United Nations Framework Convention on Climate Change (UNFCCC), United Nations Convention on Biological Diversity (UNCBD), the implementation of the 2000-2015 Hyogo Framework for Action (HFA), the 2015-2030 Sendai Framework for Disaster Risk Reduction, the Vienna Convention for Ozone Depletion, Stockholm Convention on Persistent Organic Pollutants and the Cartagena Protocol on Land-Based Sources of Marine Pollution. Although focus is on marine environment, it, however, addresses land degradation issues that affect water quality near the coastal areas

2.19 Relevant Multilateral International Environmental Conventions and Protocols

2.19.1 World Bank Safeguard Policies

The World Bank projects and activities are governed by Operational Policies (OP), which are designed to ensure that the projects are economically, financially, socially and environmentally sound. The Bank has specific safeguard policies, which include Environmental Assessments and policies designed to prevent unintended adverse effects on third parties and the environment. These specific safeguard policies address natural habitats, pest management, cultural property, involuntary resettlement, indigenous peoples, and safety of dams, projects on international waterways and projects in disputed areas.

The Operational Policies provide basis on which the World Bank screens proposed projects to determine the appropriate extent and type of Environmental Assessment (EA) to be undertaken. The World Bank classifies proposed projects as Class A, B, C or F1 depending on the type, location, sensitivity and scale of the project, and the nature and magnitude of its potential environmental impacts. The environmental Management Framework of the DVRP categorized this project has been categorized as **Category B project** and the project sponsor is responsible for any environmental due diligence required by the Safeguard Policies.

Out of the ten Safeguard Policies that the World Bank regards as critical to ensuring identification, minimization and mitigation of potential social and environmental impacts of development projects. These are five (5) that are triggered for this project.

1. Environmental Assessment (EA)
2. Forests

3. Involuntary Resettlement
4. Natural Habitats
5. Pest Management

The following discussion is on Safeguard Policies relevant to the project.

2.20.2 The World Bank Safeguard Policy OP 4.01 for Environmental Assessment (EA)

Safeguard Policy OP 4.01 for Environmental Assessment (EA) is triggered, and requires that an Environmental Management Framework (EMF) be prepared along with an Environmental Management Plan (EMP) to guide recommended measures. The assessment aspect (EA) of this report provides a general overview of potential project impacts, the EMF provides guidelines and strategies for evaluating potential impact of future projects, and the EMP provides mitigation measures, as discussed later in this report.

The other World Bank Safeguard Policies dealing with natural habitats, physical cultural resources, pest management, and forests may possibly apply and they are described briefly below:

2.20.3 OP 4.O4: Natural Habitats

This policy requires infrastructure development to take into account the conservation of biodiversity and the numerous environmental services and products which natural habitats provide to human society. O.P 4.04 prohibits projects which would lead to significant loss or degradation of any critical natural habitats, whose definition includes those natural habitats, which are legally protected, officially proposed for protection or unprotected but known to have high conservation value This policy was triggered as a precaution to ensure that any affected natural habitats are adequately protected.

2.20.4 Operational Policy 4.09 on Pest Management

Operational Policy 4.09 on Pest Management seeks to ensure that rural development and health sector projects avoid using harmful pesticides. A preferred solution is to use Integrated Pest Management (IPM) techniques and encourage their use in the whole of the sectors concerned. The Bank requires that any pesticides it finances be manufactured, packaged, labelled, handled, stored, disposed of, and applied according to standards acceptable to the Bank. The Bank does not finance formulated products that fall

in WHO classes IA and IB, or formulations of products in Class II, if (a) the country lacks restrictions on their distribution and use; or (b) they are likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly. This policy has been triggered, because human activities may involve the purchase or use of small amounts of pesticide.

2.20.5 Operational Policy 4.36: Forests;

The World Bank recognises that management, conservation and sustainable development of forest ecosystems and their associated resources are essential for lasting poverty reduction and sustainable development, whether located in countries with abundant forests or in those with depleted or naturally limited forest resources. The objective of this policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development and protect the vital local and global environmental services and values of forests. This policy applies to the following types of World Bank-financed investment projects:

a) projects that have or may have impacts on the health and quality of forests,
b) projects that affect the rights and welfare of people and their level of dependence upon or interaction with forests and
c) projects that aim to bring about changes in the management, protection or utilization
d) of natural forests or plantations, whether they are publicly, privately or communally owned.

OP4.36 is triggered by the fact that the project area has some wooded areas as forest reserves.

2.21 International Convention on Trade in Endangered Species of Wild Flora and Fauna (CITES), 5/3/83:

CITES is an international convention that aims to ensure that international trade in species of wild animals and plants does not threaten their survival. Explicit in the convention is the need to control invasive species that can affect the sustainability of indigenous and endemic species of flora and fauna.

2.22 United Nations Convention on Biological Diversity (CBC), signed by Saint Lucia on 28/7/93.

The main objective is for the conservation of biological diversity, sustainable use of the components of biological diversity and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

2.23 Protocol on Specially Protected Areas and Wildlife (SPAW)

Protocol on Specially Protected Areas and Wildlife (SPAW) **signed on 18/1/90** and managed by the Department of Fisheries.

2.24 Land-Based Sources of Marine Polution Protocol (LBS).

The objective of the LBS under Annex I-IV, is to mitigate marine pollution from land-based sources of pollution' specifically targeting domestic waste water including sewage, agricultural non-point sources of pollution

2.25 Vienna Convention for the Protection of the Ozone Layer, 28/7/93:

Vienna Convention for the Protection of the Ozone Layer, 28/7/93is a multilateral environmental agreement that provides a framework for international reductions in the production of chlorofluorocarbons due to their contribution to the destruction of the ozone layer and resulting in increase in the threat of skin cancer and impacts on global warming.

The Montreal Protocol on Substances that Deplete the Ozone Layer 28/7/93 advances the objects of the Vienna Convention by including a phase out list of ozone depleting substances for the purpose of protecting the ozone layer and reducing the effects of ozone depletion on global warming.

2.26 United Nations Framework Convention of Climate Change, 14/6/93, Saint Lucia is signatory to the United Nations Framework Climate Change Convention (UNFCCC) and has completed three (3) National Communications (NCs). Each National Communication reported on National Circumstances, Green House Gas Inventory, Vulnerability and Adaptation Assessment, Assessment of Mitigation Measures appropriate to national circumstances; Gaps and Constraints (data, institutional and capacity gaps) and other Related Matters as per IPCC guidelines. The Government of Saint Lucia has shown further commitment to reporting on Climate Change and has requested support to undertake the Biennial Update Reports (BUR) commencing in 2018. Saint Lucia's National Determined Contributions

(NDC) to the IPCC was approved and there is a plan for the reduction of emissions and increase in carbon sinks.

2.27 United Nations Convention to Combat Desertification, 30/9/97:

Broadly the convention seeks to mitigate the impacts of droughts through preparedness, reducing vulnerability and adaptation while preserving environmental quality and ecosystems.

2.28 National Environmental Policy and National Environmental Management Strategy

In October 2004, the Government of St. Lucia formulated its National Environmental Policy (NEP) and National Environmental Management Strategy (NEMS). The NEP/NEMS integrates the various United Nations conventions that include the United Nations' Convention to Combat Desertification (UNCCD), the United Nations Framework Convention on Climate Change (UNFCCC), the Convention of Biological Diversity (CBD), the Millennium Declaration, the Barbados Programme of Action for the Sustainable Development of SIDS, as well as the St. George's Declaration of Principles for Sustainable Development in the OECS.

The NEP/NEMS addresses the issues of enhancement in overall environmental quality through its various strategic actions. While all of the strategic actions are relevant the two which speak directly to the road development are:

1. Development and use of appropriate, fair, effective and efficient environmental management instruments, including financing mechanisms and technologies;
2. Development of appropriate institutional arrangements, with institutional collaboration, social participation and partnerships, and with the sharing and decentralization of environmental management responsibilities whenever desirable and feasible.

2.29 Other Standards and Guidelines (relevant)

2.29.1 OECS Building Code and Guidelines

The draft OECS Building Code and Building Guidelines outline construction standards based on the Caribbean Unified Code (CUBiC). The draft OECS Building Code includes building standards to prevent or mitigate damage from extreme natural events.

SECTION 3

BASELINE ENVIRONMENTAL CONDITIONS

3.0 Description of the Baseline Environmental Conditions

The following existing conditions are presented to establish a baseline of the existing environmental conditions on and around the site.

3.1 Access

While road serves commuters from through Sarrot, Jacmel, Vanard and through to Millet, there is currently poor motorable access to traverse from these communities directly to Anse La Raye. The road is proposed to improve the movement through Vanard to Anse La Raye and if desired then through to Millet road. It is anticipated by most persons that the road will add value to the general area.

Figure 5 Existing state of the road corridor

As a rural; community, the road network is the major transport and means of movement for the communities of Vanard, Venus, and Anse La Raye. Therefore, most development in this rural area is largely dependent on the quality of the road network. In general, the road network will impact the lives and the welfare of residents and play a crucial role in gaining access to the urban space and services, and

employment opportunities. Further, this proposed road is needed to support livelihoods, allow the authorities to gain access for the efficient management of land and water resources in the area, and allow for the timely supply of fertilizer, pesticides and allow the community to access better storage and marketing facilities and opportunities for their harvested produce.

3.2 Topography

Generally St. Lucia is incised with steep hills and valleys and many streams emanating from the forested interior which gives it a rugged steeply dissected topography. This is typical of the surrounding lands for which the existing road traverses and the upgrade is proposed. The general topography of the surrounding area is one of steep slopes with drops in some areas along with narrow valley areas and punctuated by hilly terrain rising from low altitudes of a plain to about 400metres above sea level.

3.3 Site Elevation

The road starts at an elevation on about 99m above sea level and rises by 26m over a distance of 4.1Km suggesting an average gradient of 0.6% over the 4Km distance. The road then rises at an average rise of about 11%. to 338m above sea level up to the point 6.2Km from the start and then commences to descend toward Anse La Raye at an average of about 5% grade.

The actual site of the existing road rises relatively steeply from 200m to 150m representing a gradient of **1:4** in some sections .In some parts of the site loose rock outcrops are exposed , with a thin layer of overburden. . The gradient of the general area varies significantly with moving from gentle slopes to steep and very steep slopes with several landslides observed on the site identified for stabilization. Figure 6 below provides a visual of typical embankment side slopes along the road corridor.

Figure 6 typical embankment side slopes along the road corridor

3.5 Land Ownership.

The existing road traverses land that is owned by the GOSL, however there are two instances along the corridor that may require realignment and acquisition of private property (see figures 7 & 8 below).

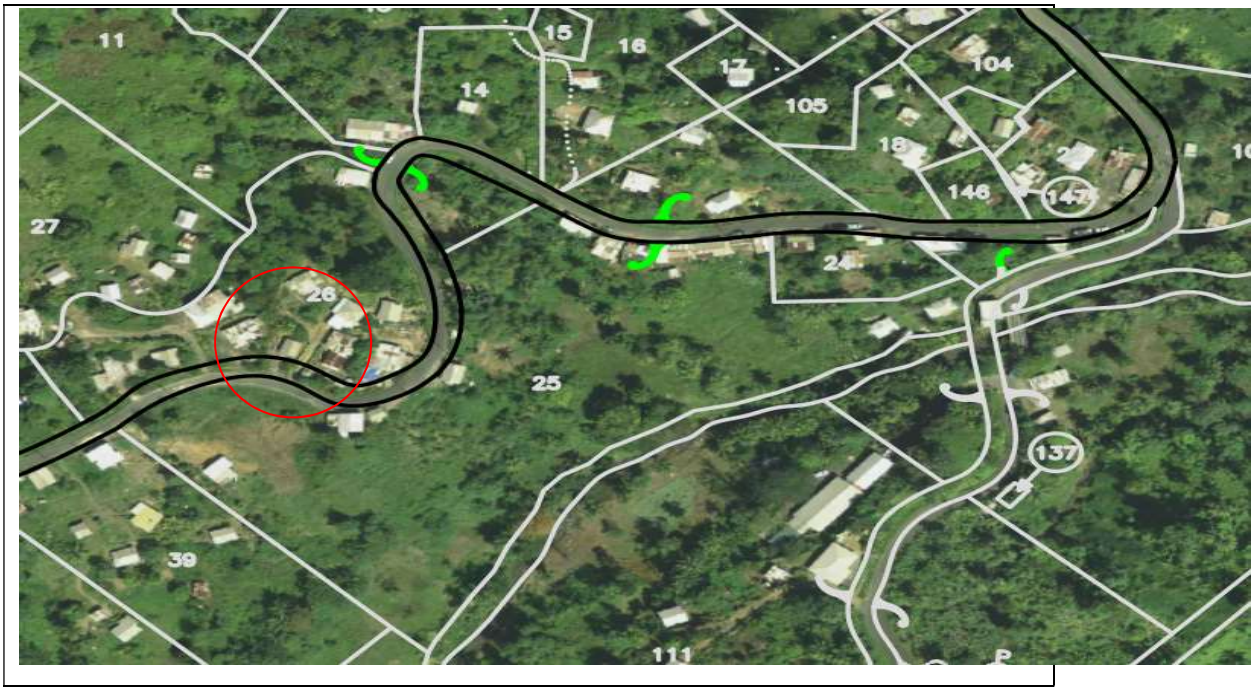


Figure 7 Area circled in Parcel 26(Crown Lands) will likely be affected by the planned improvement

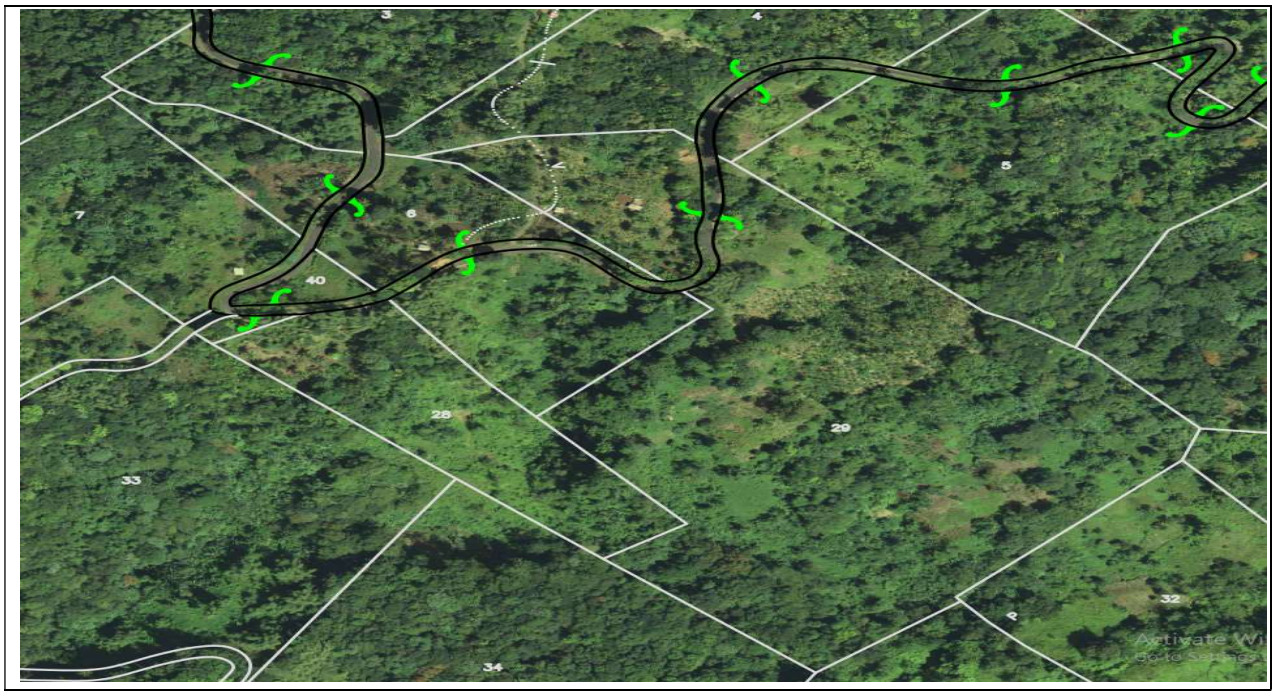


Figure 8 Parcels 6 and 29 (Lelia Lionel & Arnold Mererick, 6) & (Celricka Dantzic, 29)

The land for existing road and related infrastructure is confirmed to be under the jurisdiction of Crown. There are two sections of the road that may require realignment and would also impact private property. However, it is understood that there is expected to be Eminent Domain and possible Resident Relocation in one (1) of these instances and be triggered under the social and environmental impacts in this Project. The process of the required land acquisition is highlighted within section 6, Social and Economic Assessment.

3.6 Climate

Saint Lucia at latitude 13º 53' N and longitude 60º 68' W lies in the humid tropical zone of the north-east trade winds. Seasonal shift in these winds gives rise to a summer wet season and a winter dry season. The climate is affected mainly by the subtropical cyclone belt and the inter- tropical convergence zone (ITCZ). The location of these two meteorological systems varies in a cyclical pattern.

Table 2 Average Rainfall Figures for Location per month (in inches)

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total	AVG/ month
Anse La Raye	45.0	44.0	83.0	56.0	145.0	272.0	305.0	325.0	428.9	337.0	245.0	134.0	2419.9	201.66
Millet/Dam	194.4	103.9	180.6	131.8	173.7	330.2	362.6	420.8	507.4	461.9	396.3	270.5	3534.1	294.51
Roseau	85.2	44.4	93.4	84.4	109.0	167.6	224.0	263.8	484.0	347.5	233.9	222.0	2359.2	196.6

Source: Water Resource Management, Ministry of Sustainable Development

Two climatic seasons are generally experienced in St. Lucia, a wet season which runs from June to November and a dry season which covers the annual period from December to about May. However, due to increasingly climatic variability, these two seasons are not always predictable. Annual rainfall in St. Lucia ranges from 250inches in the central mountainous interior zone of the island to about 60 inches in the dry coastal locations. The proposed road site is subject to climatic and rainfall variations experienced on the island, with rainfall in the area ranging from 196.6 inches in Roseau to 294.5 inches in the Millet Area monthly (see Table 2). Temperature in St. Lucia is at an average of 27° C plus or minus 5° C. In the mountainous interior of the island the temperature is usually on the cooler side as are the months between November and January (see Figure 9).

Average Monthly Minimum and Maximum Temperature 1/ - (degrees Celsius)

Year	2013		2014		2015		2016		2017	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
January	22.4	29.4	23.1	28.1	22.5	29.1	22.7	27.3	22	28.9
February	23.0	29.5	23.0	28.5	22.3	29.6	23.2	29.5	22.8	29.2
March	NA	NA	21.7	28.9	21.9	28.9	22.1	29.7	23.6	29.3
April	NA	NA	22.6	29.9	23.5	29.8	23.8	23.8	24.5	30.6
May	NA	NA	23.6	30.4	24.0	30.5	23.4	30.8	25.6	30.9
June	NA	NA	24.5	32.4	24.7	30.8	23.8	30.6	25.9	30.9
July	NA	NA	24.4	30.9	24.6	30.6	23.8	30.9	25.3	31.6
August	25.0	31.0	24.2	30.5	23.5	31.1	24.7	31.5	25.7	31.8
September	23.1	31.6	23.7	31.1	23.5	32.2	24.3	31.7	24.5	32
October	21.7	31.3	22.1	31.6	23.1	32.4	24.3	31.6	24.9	31.1
November	23.1	30.5	23.7	30.3	23.3	30.5	24.1	30.5	23.9	30.8
December	23.1	28.1	22.6	29.9	23.4	29.2	23.8	30	23.5	29.9
Yearly Average	**23.1**	**30.2**	**23.3**	**30.2**	**23.4**	**30.4**	**23.7**	**29.8**	**24.4**	**30.6**

Source: Water Rosource Management Agencies, Ministry of Sustainable Development

Figure 1 Average temperatures for location

3.7 Agro Ecological /Soil Zones

As documented by CARDI in 1992, the island is divided into six (6) Agro-ecological Zones (AEZ) and the establishment of these zones took into account an analysis of various physical factors including rainfall, number of dry months per year, soil type and fertility, land capability and erodibility and slope category.

The site under consideration for the road project falls within Zones 5 and 6. Defined by the Agro-ecological Zones of St. Lucia as shown in **geology map** below. It comprises Belfond Clay Loam, Bocage Clay and Marquis Clays with relatively good drainage. The soils over the roadway and corridor and immediate surroundings are shallow.

3.8 Soils

Soil erosion is one of the largest contributing factors to land degradation. Soil erosion is the single most important environmental problem facing the island both with respect to current economic losses (losses of topsoil, nutrients, concentration of run off and resulting flash flooding, damage to infrastructure) as well as future threats to other sectors (directly to tourism, indirectly through declining agricultural productivity and rural incomes, to the stability of the whole country). It is also estimated that 90% of the

erosion which takes place in one year occurs sometimes within hours or at most over a few days [HTS a, 1997]. Soil erosion is a major problem in almost all watersheds. This problem is evident due to increased river siltation and reduction in water quality at the nearshore. Figures 10 and 11 illustrates the geology map.

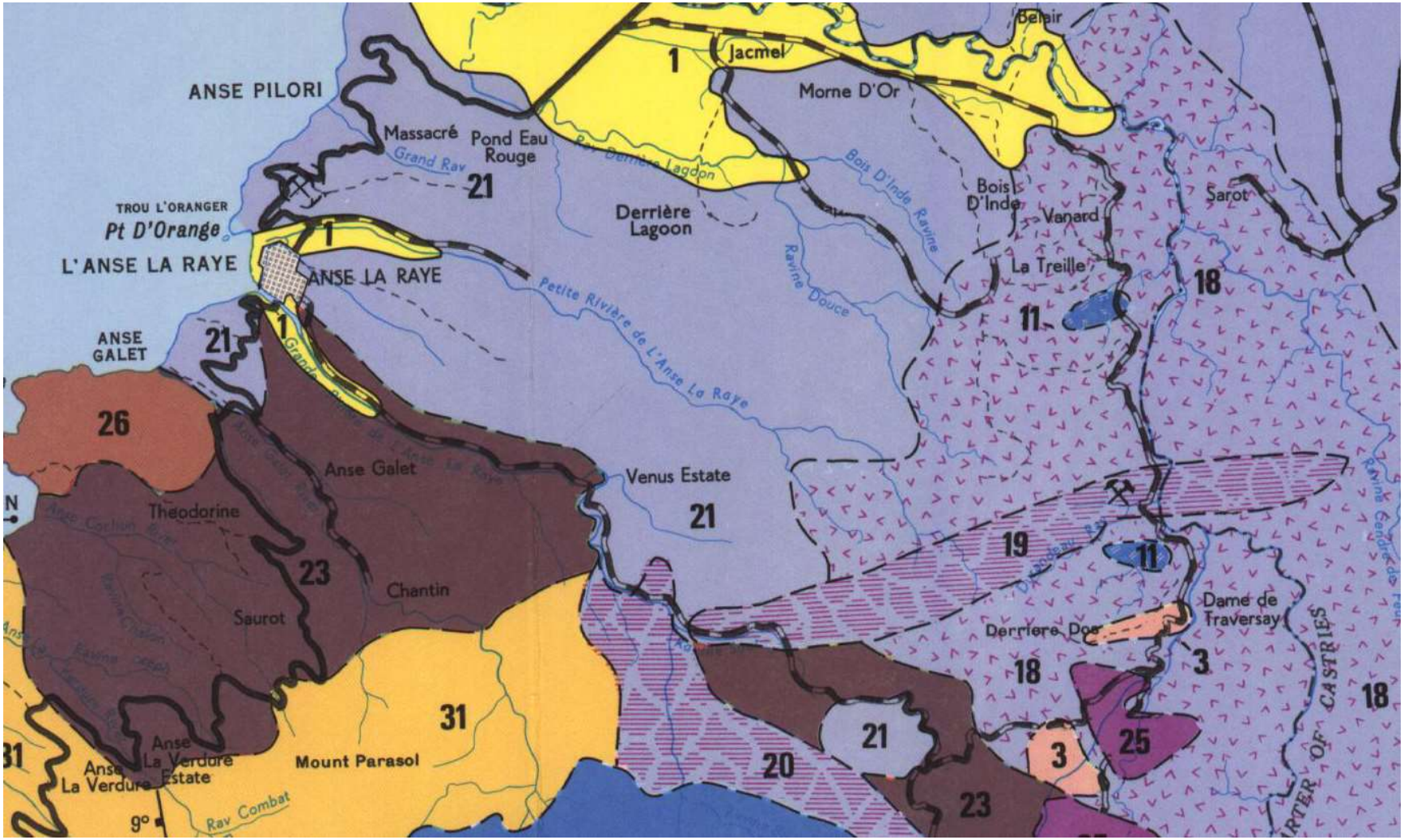
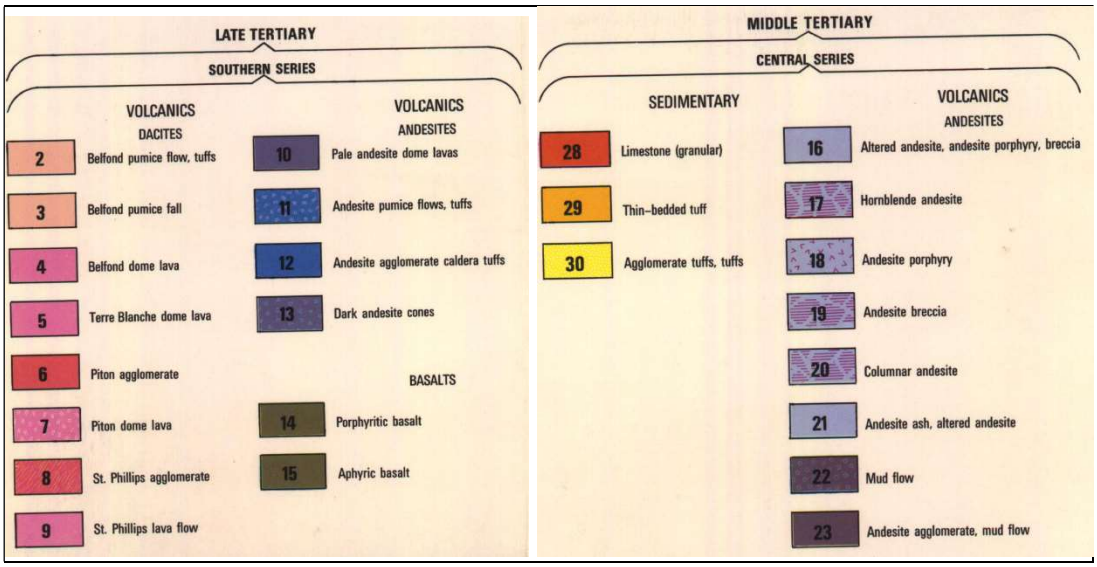


Figure 2 Geology map of the area showing the road path



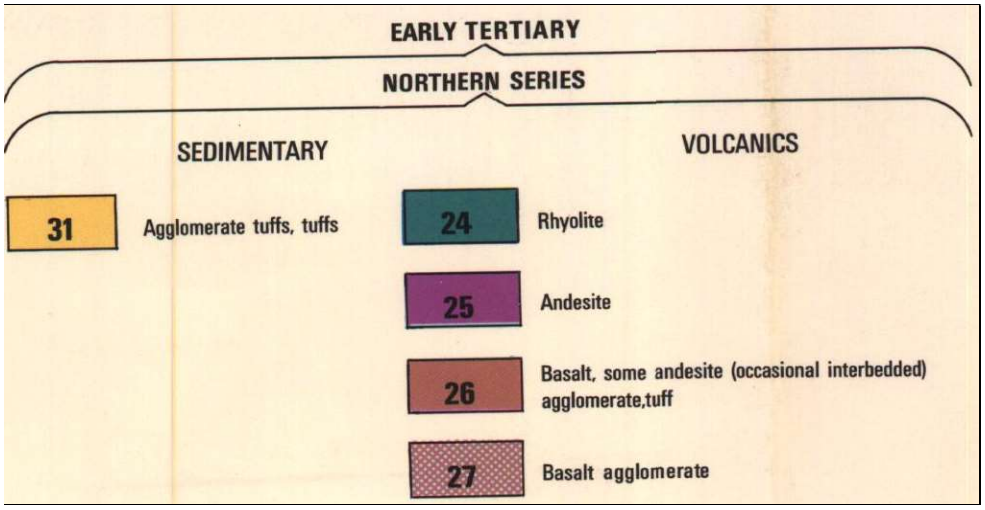


Figure 3 Geology Legend

3.10 Geology

St. Lucia consists chiefly of volcanic rocks of Tertiary to Quaternary age comprising of lava flows of basalt, andesite, dacite, agglomerates, tuffs, ash and andecitic and dacitic pumice The volcanic are classified into a Northern, Central and Southern series. The rocks of the northern series, north of the Barre de L'isle system, are mainly basaltic and comprise lava flows, agglomerates and mudflows. Andesites also occur in this area. The central series of younger rocks forms the main mountain mass. The rock consists mainly of andesitic agglomerates and ashes and are similar to those found in Anse La Raye on the West Coast. The geology for this area is defined as Andesite Breccia/Andesite Porphyritic which is overlaid by Belfond Clay Loam, Bocage Stony Clay and Marquis Clay soils. Along the proposed project road site, there is very little top soil which is mainly of a Belfond Clay loam and the Bocage Stony Clay. Regarding earthquakes, the island lies on the western margin of the Caribbean tectonic plate and is seismically active. Earthquakes occur with regularity but seldom reach magnitudes sufficient to produce damage

The geology of the site through which the road corridor traverses is not homogeneous. The road goes through eight (8) sections that change in geological profile. The start and end of each section is listed in table 3 below.

Start	End	Road Length	Geology	Description
Chainage	Chainage	M	Type	
0+00	0+430	430	18	adesite porphyry
430	720	290	11	Andesite pumice flows,tuffs
720	1190	470	18	adesite porphyry
1190	2260	1070	19	Andesite breccia
2260	2480	220	18	adesite porphyry
2480	2660	180	11	Andesite pumice flows,tuffs

2660	3080	420	18	adesite porphyry
3080	3250	170	3	Belfond pumice fall
3250	3360	110	18	adesite porphyry
3360	3440	80	3	Belfond pumice fall
3440	3880	440	18	adesite porphyry
3880	4470	590	25	Andesite
4470	4640	170	18	adesite porphyry
4640	5050	410	3	Belfond pumice fall
5050	5620	570	18	adesite porphyry
5620	6840	1220	23	Andesite agglomerate,mud flow
6840	7170	330	21	Andesite ash, altered andersite
7170	7810	640	23	Andesite agglomerate,mud flow
7810	8550	740	19	Andesite breccia
8550	8650	100	21	Andesite ash, altered andersite
8650	8850	200	20	Columnar andesite
8850	9570	720	21	Andesite ash, altered andersite
9570	11020	1450	23	Andesite agglomerate,mud flow
11020	end		1	Alluvium

Table 3 Geological classification through which the road corridor passes

3.11 Habitats

Variations in altitude, rainfall and soil characteristics have contributed to the wide variety of vegetation cover. St. Lucia has a range of forests from wet tropical, dry tropical; moist tropical, sub-tropical moist forest

to sub-tropical rain forest and wetlands, with approximately 43% coverage of tropical wet forest. It is estimated that the rate of deforestation is approximately 1.9% per annum.

According to Devaux, R., in the terrestrial environment, the diversity continues with wetlands; varying vegetation zones; riverine ecosystems and ecosystems created by micro-climatic, edaphic and other factors in valleys, canyons and on mountains. The St. Lucia Parrot has its habitat in the mountainous tropical wet forest areas within which the road traverses. The John Compton Dam was built within the natural habitat of the Lucia Parrot.. As part of the environmental mitigation measures for that project, a plan was successfully put in place for the protection of this natural habitat.

3.12 Land Capability

The site is classified as very steeply sloping in some areas with severe limitations that make them unsuitable for cultivation and restrict their use largely to woodland and wildlife. This is consistent with on site observations. The soils here are subject to restrictions of erosion and are shallow with evidence of stoniness.

3.13 Surface Water Quality

Several streams exist in the study area and flow along the eastern boundary of the road and the Roseau River generally to the west (Refer to Fig 13). As the proposed road construction activity may compromise the integrity of the streams, the consultant advises on the need to establish baseline data of the quality of the water to serve as a standard from which future assessments can be gauged. This is especially important to ensure that the plans for wastewater management and surface runoff from road construction operations are contained within a temporary holding pond.

Sources of pollution originate from both domestic and agricultural sources. Water quality is a greater problem during the dry season as the dilution ratios are smaller. It should be noted that in the upper catchment areas where WASCO water intakes are located, human settlements are often not present and thus contamination from domestic sources does not apply. Instead however contamination would come from mainly agricultural activities in these areas.

In the rainy season, the water quality problems are of a different nature. Large rainfall downpours, and floods induce high dilution ratios with respect to chemical contamination but facilitate greater runoff washes of topsoil as well as debris into the river system. High sediment loading causes clogging of intakes, water treatment problems due to high turbidity, as well as changes in the biotic life of the river system. High turbidity can result in the complete shutdown of WASCO water treatment plants, resulting in a suspension of water supply to consumers despite the high rainfall levels.

3.13.1 Turbidity

There are two active pumice quarries (the RG Quarry and the CO Williams Quarry) which operate along the main road that leads to the point where works will commence along the Anse la Raye – Venus road. One of the quarries, the CO Williams Quarry, which is more actively mined, is located immediately before the commencement point of the subject portion of roadway. During heavy rainfall, both activities, along with the wider landscape which consist largely of pumice based geology, contribute to periodic sedimentation and high turbidity levels within the Anse la Raye bay. The levels of turbidity observed prior and during rainfall events tend to be an indicator of the amount of suspended sediment within the water. High turbidity levels with large amounts of suspended pumice and soil can negatively affect the downstream existing coastal marine environment. The clouded water can prevent sunlight from reaching aquatic plants such as sea grasses and algae that fish consume, reducing the level of photosynthesis and the grow of this vegetation. Sediment can also cover the existing coral reef, another nearshore fish habitat, restricting its growth and reducing its health. Increased sedimentation in the water allows for more suspended particles that absorb heat from sunlight and increases the local temperature of the coastal waters again contributing to negative impacts on coral as well as decreasing dissolved oxygen levels. Of note is that during this EIA exercise, there were frequent rainfall occurrences and it was observed that there was a sediment plume within the bay that appeared to be

Water quality or turbidity Impacts generated from the road works are not expected to be significant. The proposed works are to run for eight months and any sediment load originating from the

disturbance of the existing road surface or adjacent lands will be of an amount that will provide a small contribution to a wider more heavier loading from the operations and landscape below the project site. As part of project works.

The necessary siltation barriers will be placed within drains and any watercourses along and adjacent to the extent of the roadworks to reduce potential transportation of loose sediment and construction material. This is an attempt to reduce the quantity of sedimented flow at the source that would lead to turbidity further downstream. at the so Additionally, prior to the commencement of works, the contractor will be required to conduct a turbidity test just downstream of the project but not beyond the existing quarry operation, to create a baseline turbidity reading unaffected by runoff and discharge from the quarry. Such tests should be conducted once a month but the monitoring of water quality as well as the inspection of the turbidity reduction measures would be done on a daily basis by the contractor. During heavy rains all works are expected to stop and all drains and sediment control measures are to be monitored, cleaned as necessary, and maintained.

Water sampling will be recommended to be conducted where works will affect the receiving water bodies in the area. These results will serve as the basis for any change in future assessment of water quality and also as a guideline for the contractors and consultants in the design and treatment of site generated waste water facilities and actual solid and liquid waste.

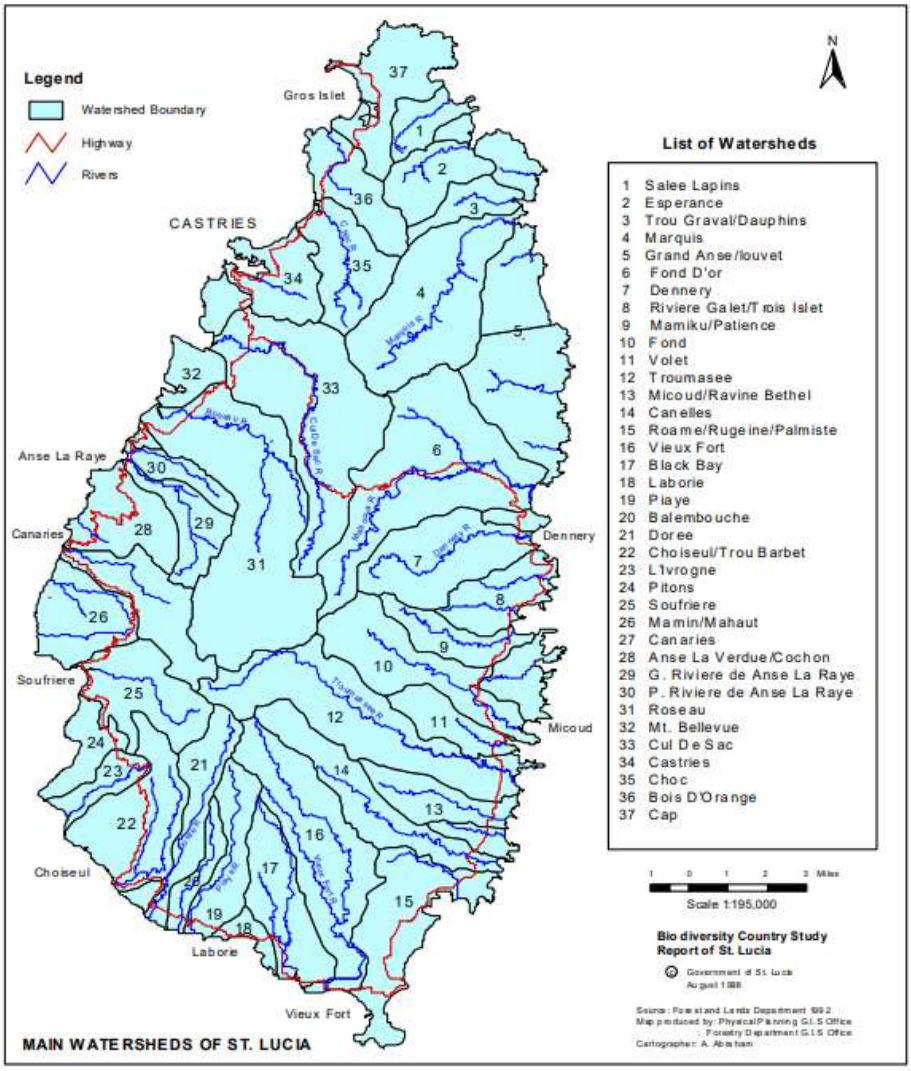


Figure 13 Watersheds of St Lucia

3.14 Vegetation and Land Use

Land use in St. Lucia can be classified as residential, commercial, industrial, agricultural and forests. Livestock farming is done on a small scale and most animals are tethered. In St. Lucia, agriculture is practiced both in lowlands and on steep slopes with banana cultivation as the major cash crop. Deforestation for agriculture, road construction, housing, quarrying and hotel development is the main cause of the island's environmental problems.

The study area can be described as mainly fallow agricultural lands, with patches of secondary dry forest in transition to tropical moist forest. According to the vegetation map of St. Lucia, sections of the road fall on the edge of the wet forest zone (Refer to Fig 15). The remaining land is a mixture of fallow land, remnants of coconut plantations overgrown with secondary dry forest and secondary moist forest. The slope of the land ranges from gentle sloping, steep to very steep. Dry secondary forests occur on the slopes near the coast. Most of this forest type has been degraded by human influence. The forested lands in the interior comprise mainly of natural forest with a few exotic species planted in small plantations.

Figure 14 context in which the road is placed through Venus, view of Morne Gimie

About 14% of the total land area or approximately 22,300 acres is Government Forest Reserve which is protected forests. The sightseeing tour view in Fig. 11 was taken from the Venus road and the tallest peak in the island interior Morne Gimie can be seen. About 30% of the island is still under some form of forest cover, however, most of it is privately owned. Apart from the natural and cultivated vegetation there are four existing and operational quarries with mining operation in the study area.

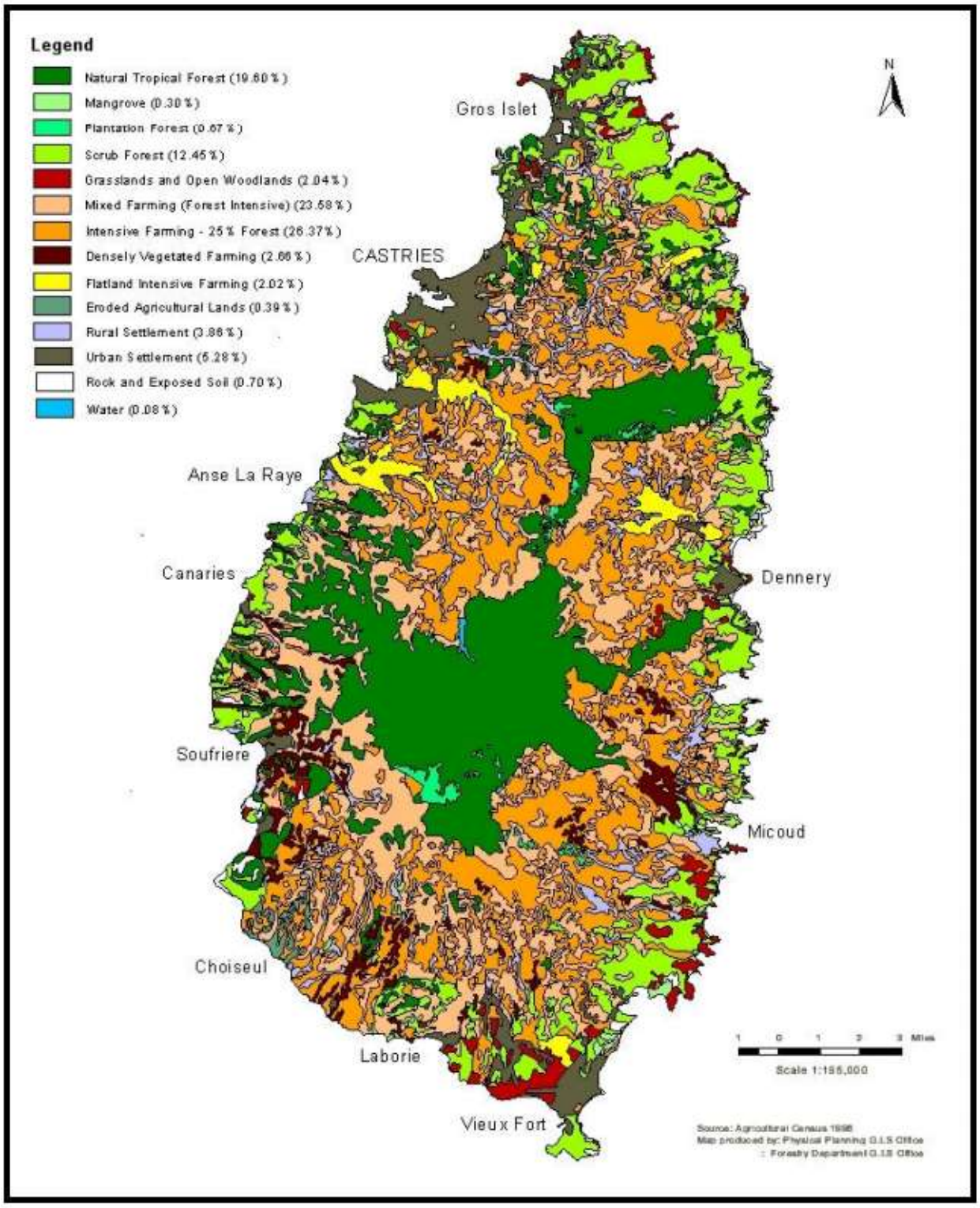


Fig 2.1 : Land Use Map of St. Lucia

3.15 Land Cover

The Land cover map representing the spatial information on types of physical coverage of the supporting the local environment in seen in Fig. 16. From this map it can be seen that the majority of the built up community areas are located on the Vanard/Venus section of the road and exposed to lower landslide risk. The combined spatial information from the flood and landslide hazard maps in Fig 16 gives an outlook of the naturally occurring phenomena on the human environment.

Figure 16 Land cover map of the area outlining project road

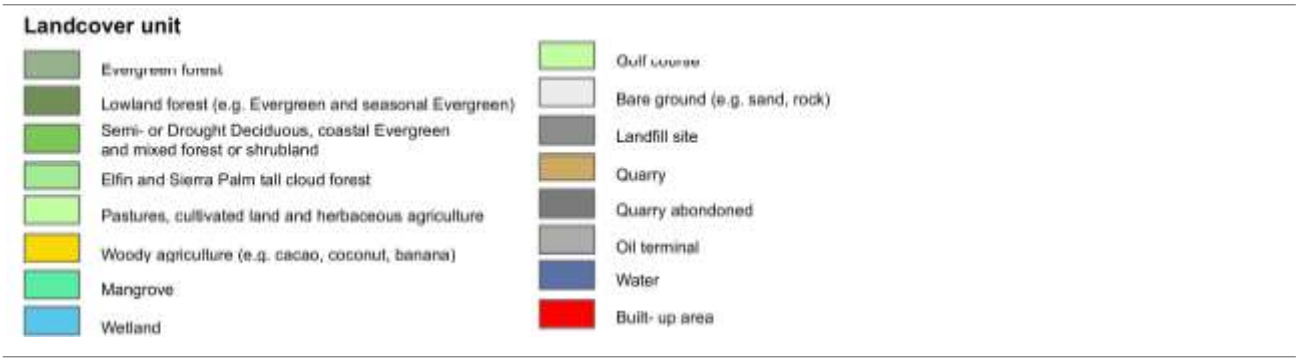


Figure 16 Land cover legend

3.15 Life Zones

According to the Holdridge scheme of life zones based on elevation, precipitation and evaporation, the life zones in the Study area range from Tropical dry forest and Tropical moist forest in the upper lands. Elevation ranges from 30m to 250m and an average temperature of 27˚C. Rainfall in the area ranges from 90 - 100 inches per year.

Table 4 . Holdridge's Life Zones

1	Tropical dry forest transition to tropical very dry forest.
2	Tropical moist forest.
3	Subtropical moist forest.
4	Subtropical wet forest.

3.16 Landscape Aesthetics

Aesthetics can be considered as subjective and so it becomes increasingly difficult to identify what may be acceptable to different groups or individuals. The proposed site for the road is far removed from the general surroundings and has consistent vegetative cover. It is also expected that even during construction of retaining walls much of this vegetative cover will not be removed and would blend into the natural surroundings over the long term.

3.17 Vulnerability to Natural Disasters

Saint Lucia is vulnerable to numerous natural disasters arising from meteorological events (high wind, excess rainfall, hurricanes, drought) and geophysical events (earthquake, volcano, tsunami). Over the past decades, these recurrent events have significantly harmed both the population's socioeconomic well-being and the country's general economic and fiscal stability.

Instances of prolonged rainfall has induced flooding and landslide activity across the island. The highest elevations within the island interior typically receive the highest rainfall. As river systems drain radially from the island's center to the coast, transit time for rainfall runoff is relatively short. This effect, coupled with the steeply sloping topography, creates the potential for flash floods

3.17.1 Physical Vulnerability.

Steep slopes dominate the island's landscape, and tilted volcanic deposits define the geology and soils. A combination of high slope angles and rainfall leads to slope instabilities and a high potential for landslides. The most common type of landslide in Saint Lucia is debris flow, which is defined as the rapid movement of a mass of soil, water, and air. Debris flows pose a significant threat to human lives because they (a) may travel long distances, (b) approach fast, and (c) exhibit a considerable destructive force. The island's mountainous landscape presents significant engineering challenges, particularly for road construction. Many roadways are bordered by high-relief vertical cuts in the landscape, which increase the vulnerability of the transportation network to landslides, debris flows, and cut failures. In addition to the island's steep topography, underdeveloped and dilapidated infrastructure has been a key challenge to reducing vulnerability to disasters. Critical public infrastructure—such as roads, bridges, and water supply systems as well as health and education facilities—remains vulnerable to climate change–related impacts, including flooding and landslides. This vulnerability arises in part from the failure to consider natural hazard and disaster risk in designing and constructing infrastructure, and from deferring maintenance over multiple years.

3.17.2 Economic and Fiscal Vulnerability.

Hydrometeorological disasters have historically imposed significant costs on the Saint Lucia economy, leading to major declines in GDP growth and general productivity. The average annual economic losses associated with extreme hydrometeorological events are equivalent to roughly 2 percent of GDP,10 while singular high-impact events such as Hurricane Allen (1980) have resulted in damages and losses equivalent to 69 percent

of annual GDP.11 The more recent Hurricane Tomas (2010) resulted in damages and losses estimated at 43.4 percent of GDP.12

3.18 Flood hazard

The coastal areas of Saint Lucia such as Anse la Raye Village and its environs are vulnerable to flood hazard by reason of their low lying nature. Additionally, the surrounding hills within the watershed along with the network of ravines and drains can contribute to flash flooding, especially during storm events with heavy rainfall. While the road traverses undulating landscape, there are low areas that can be subject to flooding which will cause damage to equipment and destruction of the works done on the road. Figure 17 below depicts the flood susceptibility map for the project site.

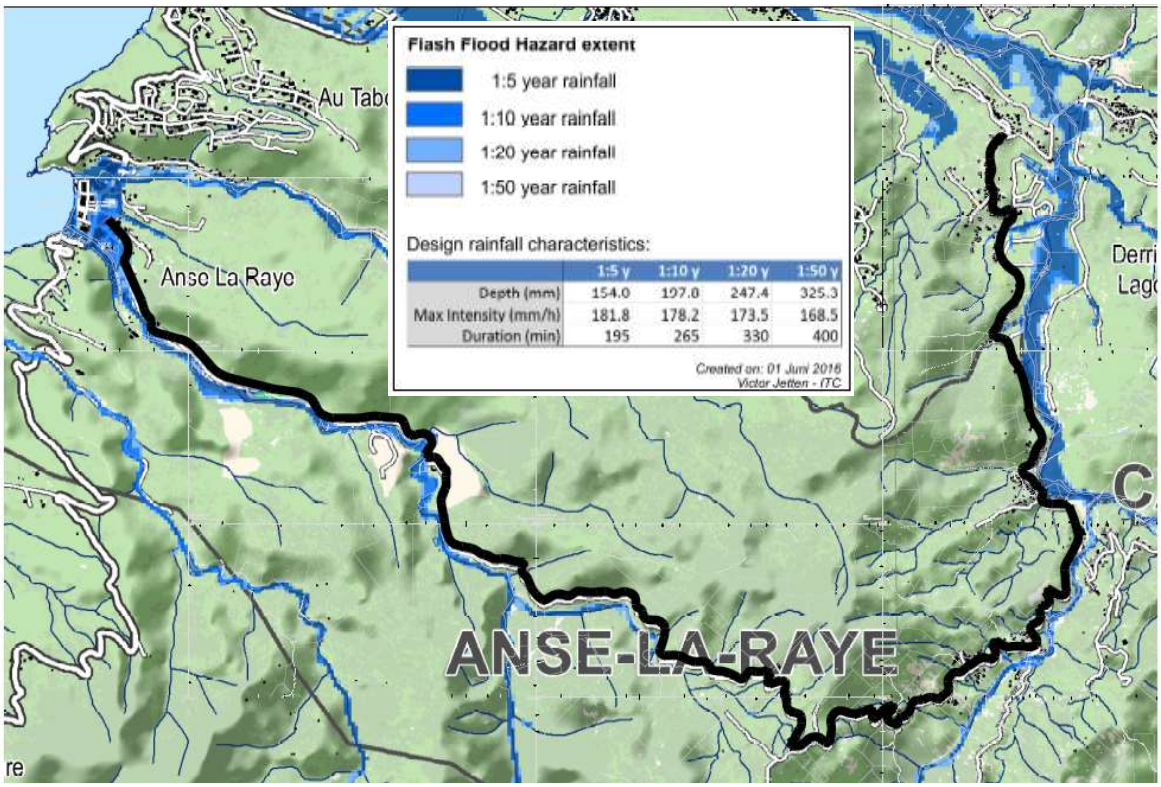


Figure 4 Flood susceptibility map showing the road alignment (extract from CHARIM)

3.19 Landslide

The project site is highly susceptible to land slide hazard as has already been recorded following Hurricane Tomas. The road is presently blocked by heavy material from the slopes and upland areas due to a series of

slides over the past 10 years especially following heavy rainfall which saturates the soils and contributes to this hazard. Such events damage major infrastructure and results in expensive measures to address. The Landslide Susceptibility map below shows the road alignment passing through areas of various risk levels. This suggest care in design and implementation to reduce loss of infrastructure over time as well as life. Refer to Figure 18 below.

3.20 The Reduction of the Vulnerability of the Infrastructure due to Natural Hazards

The community of Anse La Raye and Millet is increasingly dependent on the road infrastructure to maintain critical societal functions such as supply of food, water and energy, and security.

The properties of the road plays a major role in its susceptibility to damage. The *IPCC report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX), Geneva, March 2012*. concluded that "anthropogenic effect on phenomena such as shallow landslides

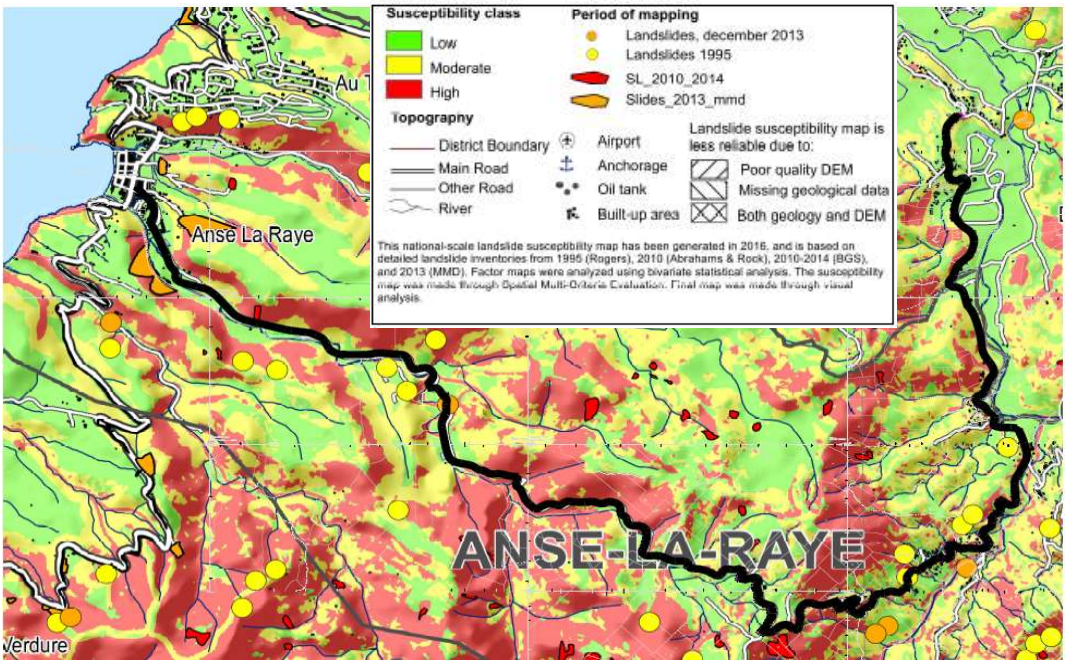


Figure 5 Landslide susceptibility map showing the road alignment (extract from CHARIM)

in temperate and tropical regions, because these are strongly influenced by human activities such as land use practices and deforestation"

The Venus to Anse La Raye section of the road in particular is evidenced for its susceptibility to landslide, given the number of slides observed. Landslides represent a serious problem particularly in the inclined area of the road, causing damage to roads and disrupting the activities of the local people. The project engineers carried out risk associated with landslips and cut slopes and concluded that at the moment all the slopes were stable as the landslips were due to an extreme rainfall event which exceeded a 1:100 year rainfall.

The Consultant engineers concluded that failures that had occurred along the roadway had been initiated by surface water flows and not an inherent slope instability and that no signs of significant progress of these failures has been noted over the almost 10 years since the initial failures. To address possible erosion and shallow failures mitigative measures including additional planting of vegetation and the flattening of slopes in areas that require such treatment have been proposed. In addition, the proposed alignment design is considered one that lessen the possibility of a repeat of the initial failure mechanism by introducing deflective upstand/curbing along pavement edge in case of flooding and generally a more resilient design.

SECTION 4

FAUNA AND FLORA STUDY

4.0 Establishing the Baseline Data on the Fauna and Flora of the Study Area

In order to develop the exiting baseline data for the study site, the consultants felt it was necessary to determine the biodiversity of the area to serve as a guideline for any conservation and mitigation measures to reduce any potential adverse impact from the proposed road project**.** This project will involve works on an existing damaged road that runs through an area of mature forest and secondary vegetation. It is not within the National Forest Reserve. The complete Fauna study is attached within Appendix 4 and the list of plants found on site in Appendix 5.

Figure 19 Photo taken of Boas in a mating ball along the roadside and Fer De Lance snake

4.1 Field Sampling Procedure

The area was sampled by traversing on foot along the proposed road area which included all habitat types within the study area. Plant species at those sites were recorded with particular attention paid to large and dominant trees.

Herpetofauna, avifauna, and other fauna were identified by sampling at those areas mentioned above and also along ridges, view points and along edge areas. All bird species seen or heard on the field sampling days were recorded. Birds were attracted by 'speeching' and other calls to verify their presence. All mammals and reptiles observed were also recorded. Additional plant species which did not occur on the sites of the proposed development but observed within the study area were also recorded.

4.2 Fauna Assessment of Venus Road

4.2.1 Summary

This section of the report presents the findings of point count assessment avifauna of the Venus Road, referred to as the study area. A desktop study of four (4) other taxa was also chosen to represent the state of fauna diversity in the study area.

The focus on birds were also due to that fact that diversity of birds, especially endemics and endangered species are found to be more plausible indicator species for the states of biological diversity in the study area. Lindenmayer 1999, argues that indicator species concept can make an important contribution to biodiversity conservation because of the impossibility of monitoring all taxa in species-rich forest environments.

A total of 24 birds species were recorded in the Seven (7) sample plots established for monitoring the birds. The survey results indicate that 5 endemics, Nine (9) of 16 Saint Lucia Priority Bird Species were occurring in the study area with varying geographic distribution.

Based on the International Union for the Conservation Nature (IUCN), the authority on defining the extinction risk of species assessed based on nine categories. The species assessed falls into 4 categories: One (1) Engendered (EN), One (1)Near Threaten (NT) and One (1) Venerable (VU). The remaining species found occurring were classified as Least Concerned (LC), meaning that there is no immediate threat to the survival of the species.

The report produced by this survey made several recommendations for priority bird species and other endangered fauna found in the Study area. The information produced may also be useful to set priorities,

allowing mitigation and conservation efforts to be focused on those species that are of greater risk of extinction locally, regionally or globally.

4.3 Methodology

4.3.1 Standardized bird counts

This survey used standardized point counts at survey plots to obtain a sample of species occurring along the Venus road. The surveyor (A. Toussaint on all occasions) stood at a survey point and detected (saw and/or heard) as many bird species as possible, scanning in all directions. For each species, the number of individuals detected was noted (D. Clament). This was done for a 10 minute interval, starting at the surveyors arrival at the survey point. The period of 10 minutes was chosen to make the data from this survey more readily comparable with data from previous bird surveys. The surveyor then repeated this count for an additional two minutes whilst „pishing" – imitating a generalized alarm call to draw birds in towards the surveyor.

4.3.2 Allocation of survey points

Seven (7) sample points were randomly allocated along the road (see figure 20).

Equipment used include binocular which was used to aid in the identification of birds. A field technician (D. Clement) took records of the species sighted or heard for all birds found in the various point stations. The records were taken on a field notebook and later entered in an Excel spreadsheet. Summary data of species is presented in Annex 1. Habitat association for all birds detected was also recorded. In addition, photographs were taken using a Canon EOS 7D Mark II camera with Canon EF 400mm 1:5.6 Lens.

The researcher focused resources on a sample assessment of priority bird species listed for Saint Lucia. Information on endangered and endemic avifauna along the Venus Road was seen as necessary because it is more amenable to the standard point count methodology and requires less material resources. More so, it does not require mist nets and traps that are used in the assessment of mammals and insects.

The focus on birds were also due to that fact that diversity of birds, especially endemics and endangered species are found to be more plausible indicator species for the states of biological diversity in the watershed. Indicator species concept can make an important contribution to biodiversity conservation because of the impossibility of monitoring all taxa in species-rich forest environments (Lindenmayer 1999).

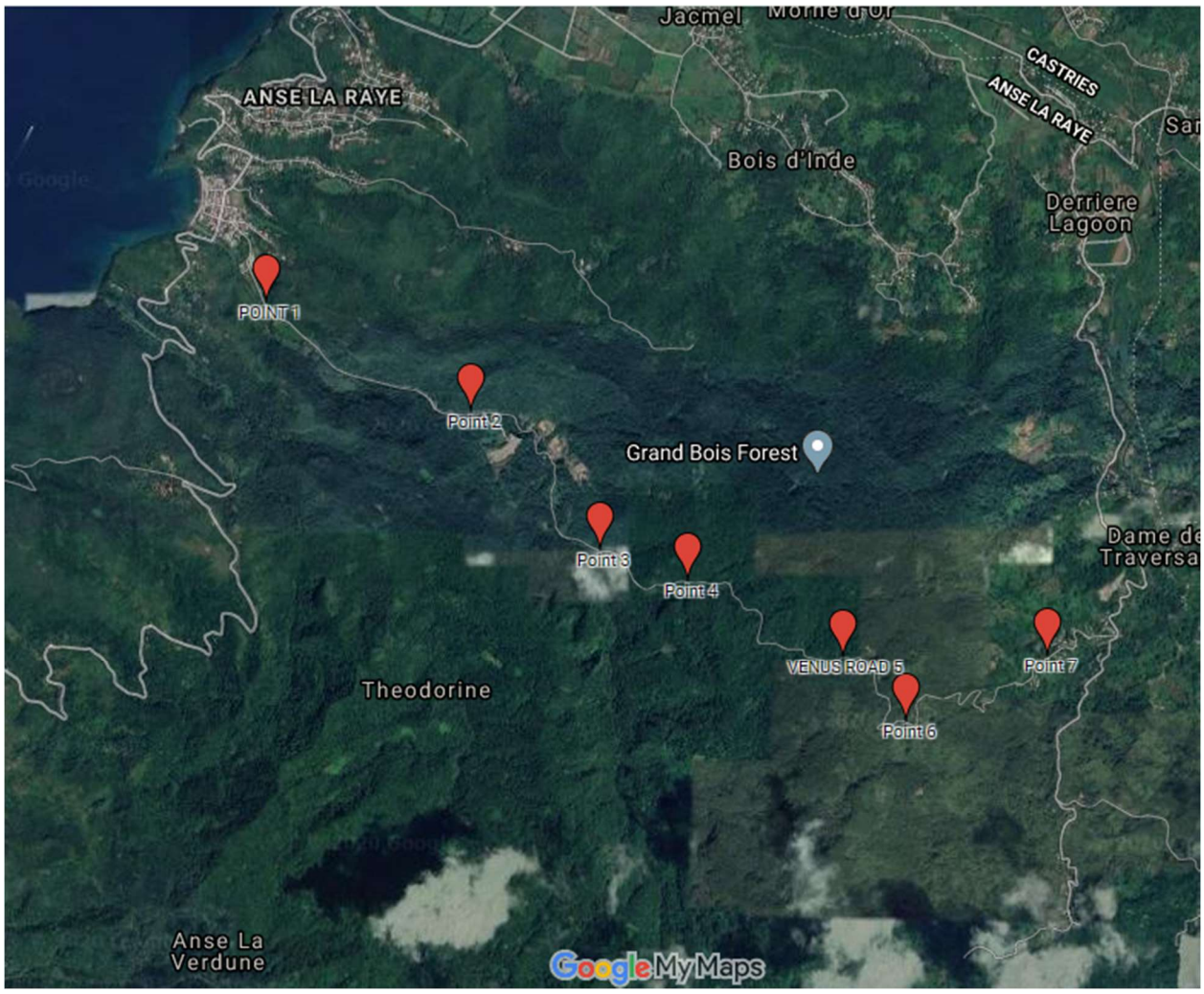


Figure 6 Point Stations Established Along the Venus Road

The selection of the priority species for the Venus Road was based on the presence of species listed by Toussaint et al (2009), in the study area. The point stations in which the species were found were highlighted on a My-Google map for a suite of 6 targeted priority species. Photographs of these species were taken and included in the final report. The targeted priority species include those that are important, rare or endangered, specifically:-

- Any indigenous (native) species listed as globally threatened by the International Union for the Conservation of Nature (IUCN) and/ or listed as nationally threatened with extinction. (Annex 1 describes the IUCN threatened species categories).

- Any non-IUCN Red Listed indigenous (native) species that appear to be: scarce, rapidly declining, endemic to Saint Lucia, known or suspected to have highly specialised needs, or are vulnerable to hybridisation with introduced species.
- Species that perform a keystone role in the ecosystems identified in the above section.
- Indigenous species that serve as indicators for ecosystems or certain conditions.
- Species that are or could be used as flagships for forest conservation

Recommendations for mitigation measures were formulated based on the best available information, knowledge and experience of the area and the behaviour of the avian species.

4.4 RESULTS

4.4.1 Frequency

A total of 24 avifauna species and total number of birds was 208 individual birds recorded in the study plots during the two days assessment, January 27 and 28 2020. Maximum number of individual in one plot was 46 (20%) in plot 1 and minimum number n=13 (7%) was found in plot 4, with a mean number of 30 individuals. The highest species diversity was found in plot 1 and the lowest in plot 4. Reference is made to figures 21 to 24 below.

It is not worthy to mention that plot 1 was located adjacent to a riparian zone, with mixed agriculture and secondary forest on one side, which can be describe as ecotone. According to definition in Wikipedia, an ecotone is a transition area between two biomes. It is where two communities meet and integrate. It may be narrow or wide, and it may be local or regional. An ecotone may appear on the ground as a gradual blending of the two communities across a broad area, or it may manifest itself as a sharp boundary line. Ecotones are also rich areas of diversity and species richness, as demonstrated in plot 1.

Whereas, plot 4 was located within a primary forest area and contained less diversity and richness of species. A number of factors may contribute to this finding, for example, the detection of species could be more difficult due to the density of vegetation on the study plot. Time of day was also a factor; in this case plot 4 was assessed at 11:30 AM January 27 and plot 1, at 6:30AM on the same day. Therefore, time of assessment is a major factor in assessing avifauna species.

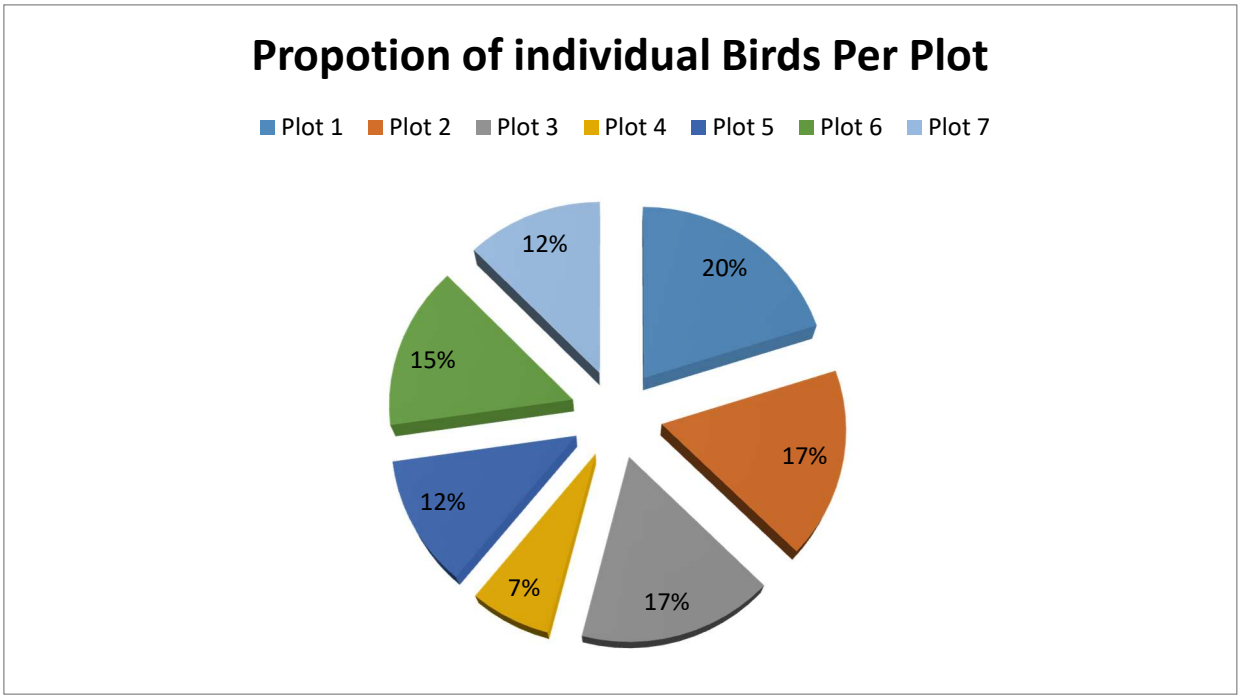


Figure 21 Proportion of Birds per Plot in the Study Area

The Saint Lucia warbler was the highest ranked species based on frequency in the survey area (n=31), followed by Lesser Antillean Bullfinch (n=24) and Banana Quit (n=20). Figure 3 below show the ranking of species detected. Ruddy Quail-Dove, Mangrove Cuckoo, Lesser Antillean flycatcher, Broad-winged Hawk and little blue heron has minimum frequency (n=1) in the study area. Figure 3 below show species frequency in the study area.

All five endemic bird species listed for Saint Lucia were detected in the study area in varying degree of frequency and distribution. As mentioned above, the Saint Lucia Warbler (n=31) was the most frequent endemic species, followed by the Saint Lucia Parrot (n=112) and the Saint Lucia Black Finch (n=7). These findings indicate that the habitats along the Venus Road are very important and contain species found occurring only in Saint Lucia.

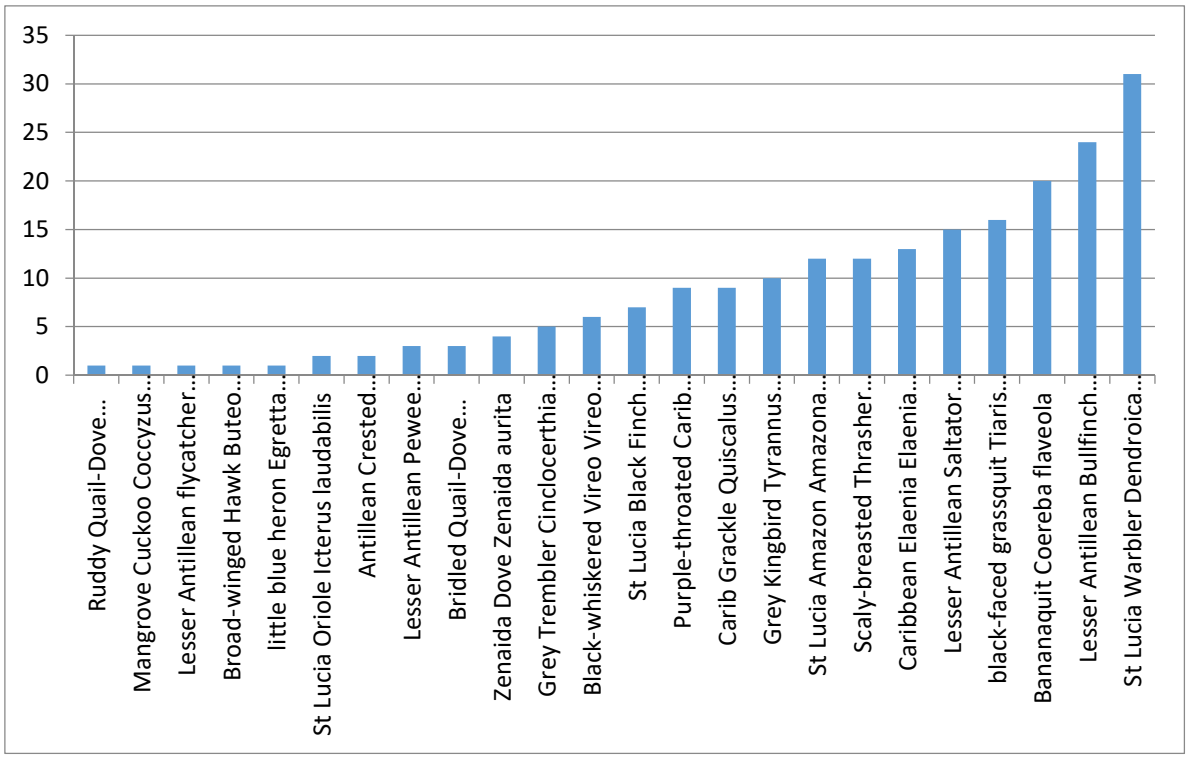


Figure 7 Species frequency in the Study Area

Nine (9) Saint Lucia Priority Bird Species for Conservation (figure 4) out of a total of 16 were found occurring in the study area. Annex III below provide a list f the Priority Species for Saint Lucia and subsequent section give descriptions of each species with photographic images. In the suit of Priority Bird Species, the Saint Lucia warbler was the highest ranked (n=31 or 39%), followed by the Lesser Antillean Saltator (n=15 or 19%) and the Saint Lucia Parrot (n=12 or 15%). The Lessor Antillean Fly Catcher (n=1 or 1%) and the Saint Lucia Oriole (n=2 of 3%) occurred at very low frequency (Figure 4 and 5). No specific reason can be associated with the low frequency and distribution of these two priority species. It is worth noting that the list of priority species occurring in the study area is consistent with the same habitat type in Saint Lucia.

IUCN Category of species includes, One (1) Engendered (EN), Saint Lucia Black Finch and one (1) Near Threaten (NT), Saint Lucia Oriole and one Vulnerable (VN), Saint Lucia Parrot. All the reaming species were categorized as Concerned (LC). Annex 1 provides detail on the IUCN criteria for classification.

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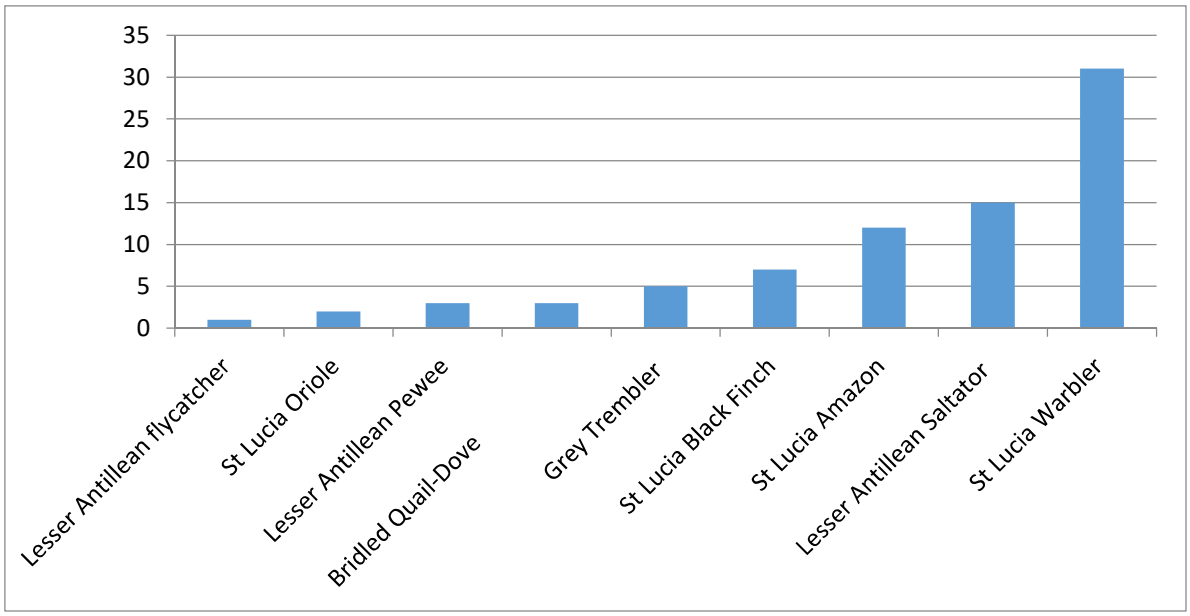

Figure 23 Ranking of Priority Bird Species for Saint Lucia Occurring in the Study Area

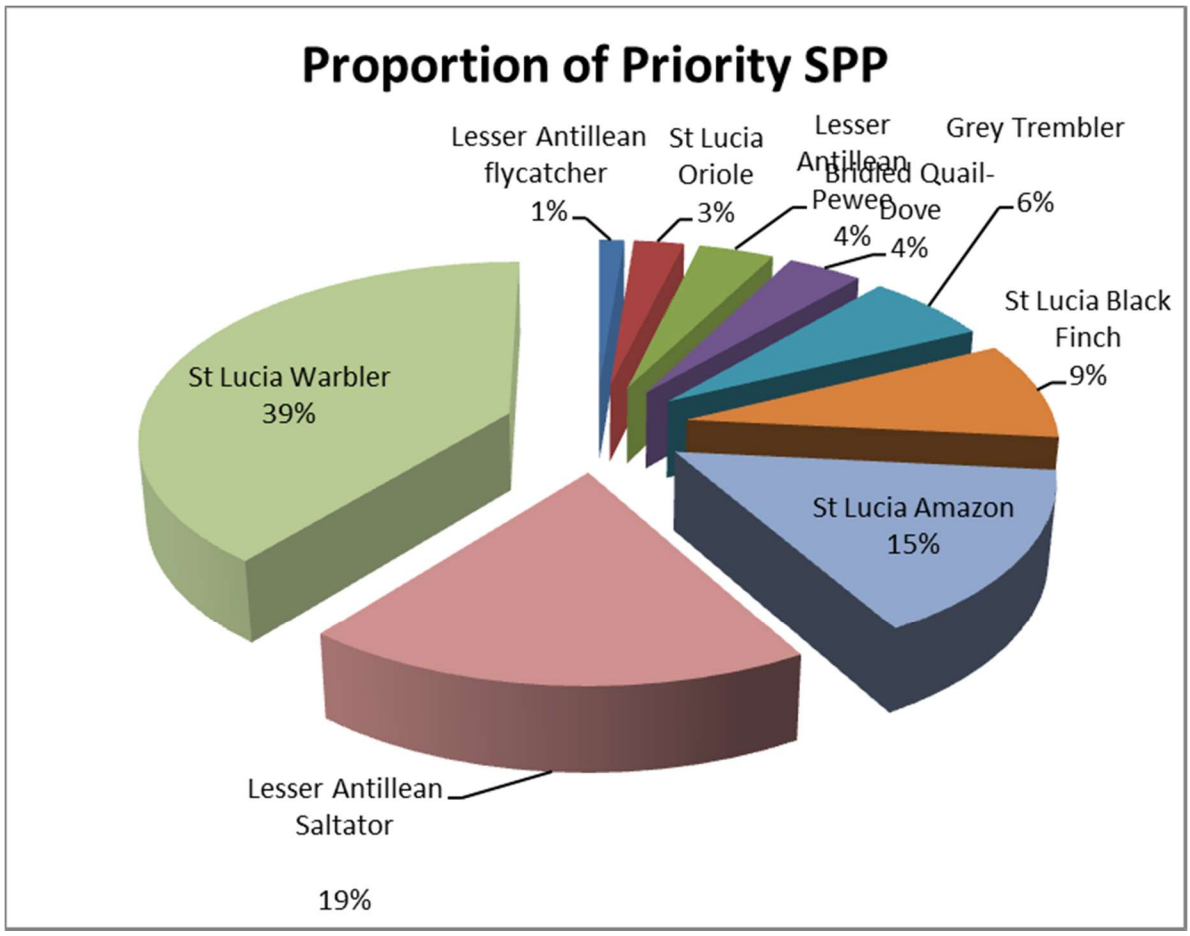

Figure 24 **Proportion of Saint Lucia Priority Bird Species Occurring I the Study Area**

4.5 Discussion on Individual Distribution of Targeted Priority Birds Species in the Watershed

4.5.1 St. Lucia Oriole *Icterus laudabilis*

Local Name: Carouge

Two (2) Saint Lucia Orioles were recorded in the study area and was distributed in two study plots or points. These were plot 1 and 3, which were ecotone habitats and mixed agriculture holding near forested areas, respectively.

According to the IUCN, the Saint Lucia Oriole is classified as Near Threatened because it has an extremely small range and small population and, although numbers appear to be stable at present, population trends are poorly known and should be monitored. The oriole is widely distributed in low frequency on the island and inhabits coastal vegetation, dry scrub, edges of banana plantations, plantation forest, secondary and primary forest up to 700 m.

Figure 25 St. Lucia Oriole

The Saint Lucia oriole may deserve special attention because of the unresolved matter of the level of two likely impacts on its population. Firstly, it is susceptible to brood parasitism by the shiny cowbird *Molothrus bonariensis minimus* a species found predominantly in cleared areas and hence likely to increase with increasing human impacts on the landscape (Keith 1997). Keith (1997) also mentions the possibility of harassment by the Spectacle Thrush (*Turdus nudigenis nudigenis*). Secondly, it has been speculated that the oriole, as a species favoring the edges of banana gardens (Keith 1997), may also be susceptible to secondary poisoning from agrichemicals. However, there has been no empirical assessment of the impact of either brood parasitism or secondary poisoning on this species. Notwithstanding the lack of empirical evidence to support the above mentioned treat to the species, it is worthy to mentioned that the Shiny Cowbird and the Spectacle Thrush were both found occurring in the watershed which can possibly be a potential threat to the species

4.5.2 St. Lucia Warbler Dendroica Delicate

Local Names: Chic-chic, Sequia Ba bad

The Saint Lucia Warbler was distributed in all point assessed in the study area. The species was the most frequent species occurring in the study area. The warbler in this survey and in the 2009 island wide bird

survey was the most frequent endemic and Priority Species occurring species, but ranked 5th in all birds frequent in that island wide survey.

The conservation status as LC is warranted for this species in based on findings here.

The warbler was found occupying a wide range of habitats in the study area. They feed actively, gleaning insects and spiders from leaves and twigs. Although the global population size has not been quantified, the species is listed as Least Concern (LC) because it is not believed to approach the thresholds for the population decline criterion of the IUCN Red List (i.e. declining more than 30% in ten years or three generations).

Figure 26 ***ST. LUCIA WARBLER Dendroica delicate***

4.5.3 Saint Lucia Parrot: Amazona Versicolour (Endemic)

Local Name: Jacquot

The Saint Lucia parrot was represented in three (3) study points. The parrots' habitat is primarily moist forest in the mountains, but it can also occur in the secondary forest and cultivated areas which characterize the habitat in the Venus area. They travel considerable distances to feed in the forest canopy on a wide variety of fruits (including awali, mangoes, wild passion fruit, etc.), seeds, flowers and sometimes insects. The parrots roost deep in the forest, flying out to the edges to forage during the day.

The breeding season is primarily from February to May. The parrots nest in cavities of tall trees *(gommiere, chataniere* and others) where the adult female lays two (occasionally three) white eggs deep inside a hollow tree trunk.

Figure 27 SAINT LUCIA PARROT

4.5.4 Lesser Antillean Pewee *Contopus oberi*

Local Names: Gobe-Mouche, or Pin Kaka

The Lesser Antillean Pewee also classified as the Saint Lucia pewee is a small flycatcher which was found occurring only 2 study point, plot one and plot 2, and also at very low frequency (n=3). This species is listed as a Least Concern species by the IUCN and is found in a wide range of forested habitats ranging from the coast to the interior of Saint Lucia. They generally occur in the forest understory; hence the maintenance of the understory in the forested areas is important for the conservation of the species.

Figure 28 LESSER ANTILLEAN PEWEE *Contopus oberi*

4.5.5 St. Lucia Black Finch *Melanospiza richardsoni*

Local Name: Moisson Pied-blanc

The Black Finch was distributed in Three (3) point stations in the study area. Seven (7) individuals were encountered and recorded during the study, in plot 4, 5 and 6 which are dominated by primary forests. This species is listed by the IIUCN as an Endangered Species (EN). This species qualifies as Endangered because it has a very small global population and frequency in it range is considered to be low. Such is not the case for the along Venus Road, especially in the primary forested areas.

Figure 29 *Female Saint Lucia Black Finch*

Figure 30 *Male Saint Lucia Black Finch*

This bird feed primarily on the ground on seeds, fruit and insects; at times they can be seen feeding on berries of low shrub plants in the under canopy. This feeding behavior makes the bird very vulnerable to predators such as mongoose, rats, feral cats and other alien invasive species. The decline in habitat through clearance for agriculture, urban and tourism development can impact on it range.

4.5.6 Lesser Antillean Saltator *Saltatoralbicollis*

Local Name: Gros-bec

This is a common year-round resident on Saint Lucia which occurs primarily in the second growth, dry scrub and forest edge undergrowth at lower to mid elevations. The species occurred in four (4) point at medium frequency (n=15) in the study area.

The species is categorized by IUCN as Least Concern (LC) because the population is not believed to be decreasing sufficiently rapidly to approach the thresholds under the population trend criterion (>30% decline over ten years or three generations). The population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion ((<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure), The IUCN Red List of Threatened Species.

Figure 31 LESSER ANTILLEAN SALTATOR

4.5.7 Grey Trembler Cinclocerthiagutturalismacrorhyncha

Local Name: Trembleur

Grey Trembler are known to occurs at all elevations and can be seen in both moist and semi-arid forest and woodlands in Saint Lucia. Saint Lucia and Martinique comprise the entire range of the Grey Trembler.

The specie was found occurring in two (2) points, point 1 and 5, and was frequent (n=5), with point 5 having the highest density (4).

According to the IUCN, this species is Least Concern (LC) although it may have a small range, it is not believed to approach the thresholds for Vulnerable under the range size criterion (Extent of Occurrence <20,000 km2 combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). The population trend appears to be stable, and hence the species does not approach the thresholds for Vulnerable under the population trend criterion (>30% decline over ten years or three generations).

Figure 32 GREY TREMBLER *Cinclocerthiagutturalismacrorhyncha*

4.5.8 Lesser Antillean Flycatcher *Myiarchus oberi sanctaeluciae*

Local Name: Pipirite Gros Tête

Lesser Antillean Flycatcher is a rare and elusive bird in Saint Lucia, primarily found in the transition forest at medium elevation and in the rainforest. The flycatcher was encountered in only one (1) sample points, with limited frequency (n=1) in the study area. It must be admitted this bird is very elusive and a challenge for detection.

This species is of Least Concern (LC) although it may have a small range, found in Barbuda, Dominica, Guadeloupe, Martinique, Saint Kitts and Nevis, and Saint Lucia, it is not believed to approach the thresholds for Vulnerable under the range size criterion.

Figure 33 LESSER ANTILLEAN FLY-CATCHER

. **4.5.9 Bridled Quail Dove** *Geotrygon mystacea*

Local Names: Colombe à Croissants, Perdrix Croissant (Guad, Mart. St L)

The white streak below the eye, brown upperparts (except for crown and neck) and reddish brown limited to a patch on the wing are good field marks for the identification of the Quail Dove. The female is less iridescence on hind neck and upper back.

The distribution and frequency of the Quail Dove in the study area was limited to only two plots, 2 and 4 of the sample sites in which just 3 individuals were recorded. The rarity in frequency and distribution of the dove in the Venus road area is reflective of the species account in national surveys data, 2009 (M.Morton pers. Comm.) and the Status and Conservation of Saint Lucia Birds (Toussaint et al 2009).

Despite the fact that the population trend appears to be decreasing, the decline is not believed to be sufficiently rapid to approach the thresholds for Vulnerable under the population trend criterion (>30% decline over ten years or three generations) Birdlife International 2011)). It must be admitted that the population size of this dove has not been quantified; however, the species is evaluated as Least Concern (LC), by the IUCN. The LC category was given mainly because it is believed that the global population have not approach the thresholds for Vulnerable under the population size criterion ((<10,000 mature individuals with

a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure) Birdlife International 2011)).

Figure**34 BRIDLED QUAIL DOVE Geotrygon mystace**

4.6 Desk Top Study of Mammals, Reptiles and Amphibians in the Study Area

There are 10 known native mammals listed for Saint Lucia; 9 of the 10 mammals are bats. The large endemic Saint Lucia musk rat (Megalomys luciae) is the only non-bat native mammal, which is now believed to be extinct in the wild (Clarke, 2009).

Mammalogist Dr Frank Clarke, assisted by forestry conducted fieldwork for 12 weeks from 16th January to 08th April 2009. The objective was standardized assessments of the diversity and relative abundance of mammals at more than 20 sites among key forest types identified by the project botanist and critical habitat specialist as occurring on St Lucia.

Only one of the 20 survey point established and assessed by was located in the Millet, area and can be used to extrapolate over wider area including the Venus Road.

Dr. Clarke describe most of the bats as beimg widespread throughout the island and therefore the same can be said for the target watershed. Clarke also concluded that many bat species are in decline due to the loss of forest cover, major roost sites and other factors, and Saint Lucia.

The 2009 mammal survey captured more than 370 mongoose, opossum, rats, and agouti were recorded (observed directly, indirectly observed, trapped or captured). The most widely-distributed and most commonly observed and trapped mammal is the small Asian mongoose, an introduced species that is a major threat to St Lucia's native birds, reptiles, and amphibians.

All of these species described as widespread are known to occur in the Venus road area.

There were no sighting or indices of feral pigs during the study. However, some historical accounts provided by two individuals who frequent the area indicated the possibility of the presence of feral pigs. It is noteworthy to mention that feral pigs have no conservation interest for Saint Lucia. According to the Saint Luca National Invasive Strategy 2012-2021, Pigs (Sus scrofa), as a species, are not protected by Saint Lucian law: they are a highly valued source of food and kept in pens by farmers. Feral pigs are invasive and widespread in the Forest Reserve, threatening some rare birds and reptiles, and interfering with tree recruitment and livelihoods by destruction of home gardens.

While there is no direct relationship between the proposed road expansion and the presence of feral pigs; indirectly, better access roads can facilitate control of feral pigs. On the other hand, improved road access may also facilitate increase pig farming and chances of pigs becoming feral. Feral pigs need to be controlled. and a coordinated effort with the Forestry Department is recommended for public awareness activities with farmers and hunters to manage the spread of feral pigs in the project area.

LOCAL NAME	**SCIENTIFIC NAME**	**GEOGRAPHIC STATUS**	**CONSERVATION STATUS**
Jamaican Fruit Bat	*Artibeus jaimaicensis*	Most common spp on the island	LC
Blossom Bat o Insular Single Leaf Bat	*Monophyllus plethodon*	Second most common spp. Endemic to the Lesser Antilles	LC
Fruit Eating Bats	*Ardops nichollsi* luciae	Regional Endemic	LC

Saint Lucia little yellow-shouldered Fruit Eating Bats	*Sturnira lilium* luciae	Regional Endemic occurring only in Saint Lucia and St. Vincent	LC
Insect eating naked-backed bat	*Pteronotus davyi*	Global	LC
Insect Eating Bat	*Molossus molossus*	Global	LC
Insect Eating Bat	*Tadarida brasiliensis*	Global	LC
fishing bat	*Noctiolio leporinus*	Global	NE
	Brachyphylla cavernarum	Global	NE

Table 5 Bats Species Occurring On Saint Lucia and recorded in the general Millet Anse La Ray Watersheds

4.7 Reptiles and Amphibians

Saint Lucia is geographically outstanding and significant for reptiles, with seven endemic species - 53% of indigenous terrestrial species - Saint Lucia anole Anolis luciae, Saint Lucia pygmy gecko Sphaerodactylus microlepis, Saint Lucia fer-de-lance Bothrops caribbaeus, and Saint Lucia thread snake Leptotyphlops bruilei are four of the endemic reptiles that are known for the Venus Road in vary degree of frequency and distribution. There are five endemic subspecies, including the Saint Lucia boa Boa constrictor orophias which is also listed for the Anse La Ray Millet watershed and can aso found occurring in the Venus area.

Figure35 **Saint Lucia thread snake** Leptotyphlops bruilei (Photo by Dr. J. Dultary)

Figure 36 Saint Lucia boa Boa constrictor orophias (Photo By Dr. J. Dultary)

Figure 37 Saint Lucia fer-de-lance *Bothrops caribbaeus* **(Photo by Bob Williams)**

Six (6) known alien reptiles have been have been listed for Saint Lucia. The Anolis wattsi is spreading very rapidly across the island and observed along the Venus road, appears to be capable of displacing the endemic *Anolis luciae* (Daltry, 2009).

The amphibian list for saint Lucia include only two native species and three (3) alien invasive, all are also listed in the study area and are described by Daltry, 2009 very abundant on Saint Lucia. This includes the Johnstones whistling frog (*Eleutherodactylus johnstonei*); whereas, the alien amphibians are includes the notorious cane toad, *Bufo marinus*

Figure 38 Cane Toad, *Bufo marinus* (Photo By Dr. J. Dultary*)*

While only two reptiles are currently shown on the IUCN (2009) Red List as threatened with extinction, almost all of the endemic taxa are in serious decline and meet IUCN‟s criteria as being globally threatened, including the endemic pygmy gecko (both subspecies), thread snake and fer-delance (Daltry, 2009).

4.8 Conclusion and Recommendations

Mitigating the predicted impact on the priority and endangered bird species and the biosecurity management during and after construction to prevent the introduction or increase in the population of alien invasive predator species are the two most important concerns for this ESIA. Ideally, there should no alteration or fragmentation of the existing forests to ensure the conservation of the endangered species, especially the Saint Lucia Parrot, Black finch and Oriole, all listed as endangered species by IUCN. However, the interest of the client has to be taken into consideration and the next best alternative must be considered. The following recommendations are suggested guidelines to mitigate the impact of the road improvement process on the priority species and other endangered fauna. The International Union for the Conservation of Nature (IUCN)

Categories, Status of Birds Species Occurring in the Soufriere Watershed, and the List of Priority Species For Saint Lucia can be found in detail in Annexes 1 to 3 in the fauna report in Appendix 4.

1. Guidelines for Mitigation of Priority and Endangered Bird Species

The timing in the operation of heavy equipment is necessary to mitigate the impact on endangered and priority bird species, especially the Saint Lucia Parrot, Black finch and Oriole listed in Annex II. Reducing operation during the feeding activity period of birds, 6AM to 8Am and 4PM to 6PM can help reduce stress and displacement of these species, especially in the areas where the road traverse through primary forest areas. Reducing noise level is also necessary during the parrot nesting period, from February to May, of every year. Studies have shown that persistent high noise levels are associated with parrot nest abonnement.

2. Measures to Limit the Threat of Invasive Predators

Invasive predator control measures will be warranted here because of the increase in the invasive predators that may be attracted to the new development in the area. Management of mongoose, rats, dogs, cats and other predators is necessary for the conservation of the priority species.

Biosecurity protocols during construction is necessary to reduce the incidence of invasive alien species, such as rats, mangoes and other pest that can be brought in with heavy equipment, materials ect. The following are some necessary protocols during construction:

- Measures to prevent workers brining in cats, dogs and other potential predator pets during operation phase.
- Careful inspection and when necessary sainting of equipment brought into the site to prevent contamination and spread of pest, invasive and diseases.
- Education, inspection and where necessary sanitizing of worker's personal containers or any other item which can harbour known pest, diseases and invasive.
- Proper waste management in line with existing national laws is paramount in reducing the impact of invasive species, pest and diseases which can impact the conservation of the biodiversity, specifically, the endangered species occurring in the project area. Therefore, waste produced during construction should be carefully managed and disposed according to guidelines established by the Solid Waste Management Authorities in Saint Lucia.

3. Measures to Manage the possible occurrence of Feral Pigs

The possibility of the presence of feral pigs may exist to some limited extent. However, if they are discovered originating from the escape from pig farms, there will be the need to control such animals as they can potentially damage agricultural crops and attack humans. Coordination with the Forestry Department is recommended for public awareness activities with farmers and hunters to manage the spread of feral pigs in the project area.

4.9 FLORA Assessment

4.9.1 Introduction

An assessment of the flora found along the roadsides between Anse La Raye and Venus was undertaken to identify existing species which included endemic, rare and endangered species found in the area, and then to provide recommendations in respect to the impact of the proposed road works on the existing flora.

4.9.2 Study Area Overview

The study area is limited to vegetation close to the road that runs from Anse La Raye inland to Venus. For several miles the road follows the Roseau valley and then rises quiet steeply away from the valley and up to the farming community of Venus. Elevations start close to sea level and rise to about 300m. Forest cover is generally quite complete and vegetation lush apart from the lowest part of the valley which has been cleared for housing and agriculture and where there are quarries. Small gardens are also found close to the road with rather more intensive farming closer to Venus (Fig. 39). Vegetation analysis using data from three plots along the road determined that lower elevations of the road were covered by **Semi-evergreen Seasonal** Forest transitioning to **Lower Montane Rainforest** at higher elevations. The riparian semi-evergreen seasonal forest was very biodiverse with many rare and locally endangered species present some of which are illustrated in

the report. As this vegetation class has largely been cleared for cultivation, Grande Riviere valley which is much less disturbed is an important natural reserve.

The lower montane rainforest roadsides at higher elevations are more disturbed and secondary in nature. However the rare Saint Lucia endemic, *Acalypha elizabethae* is present here.

The floral analysis shows that the sides of the road from Anse La Raye to Venus are very botanically biodiverse with the presence of many species very rare elsewhere in Saint Lucia. This is particularly true of the lower elevations which have a rich riparian semi-evergreen seasonal Forest cover. However the upper elevations are also of interest particularly with the presence of the rare Saint Lucia endemic, *Acalypha elizabethae*.

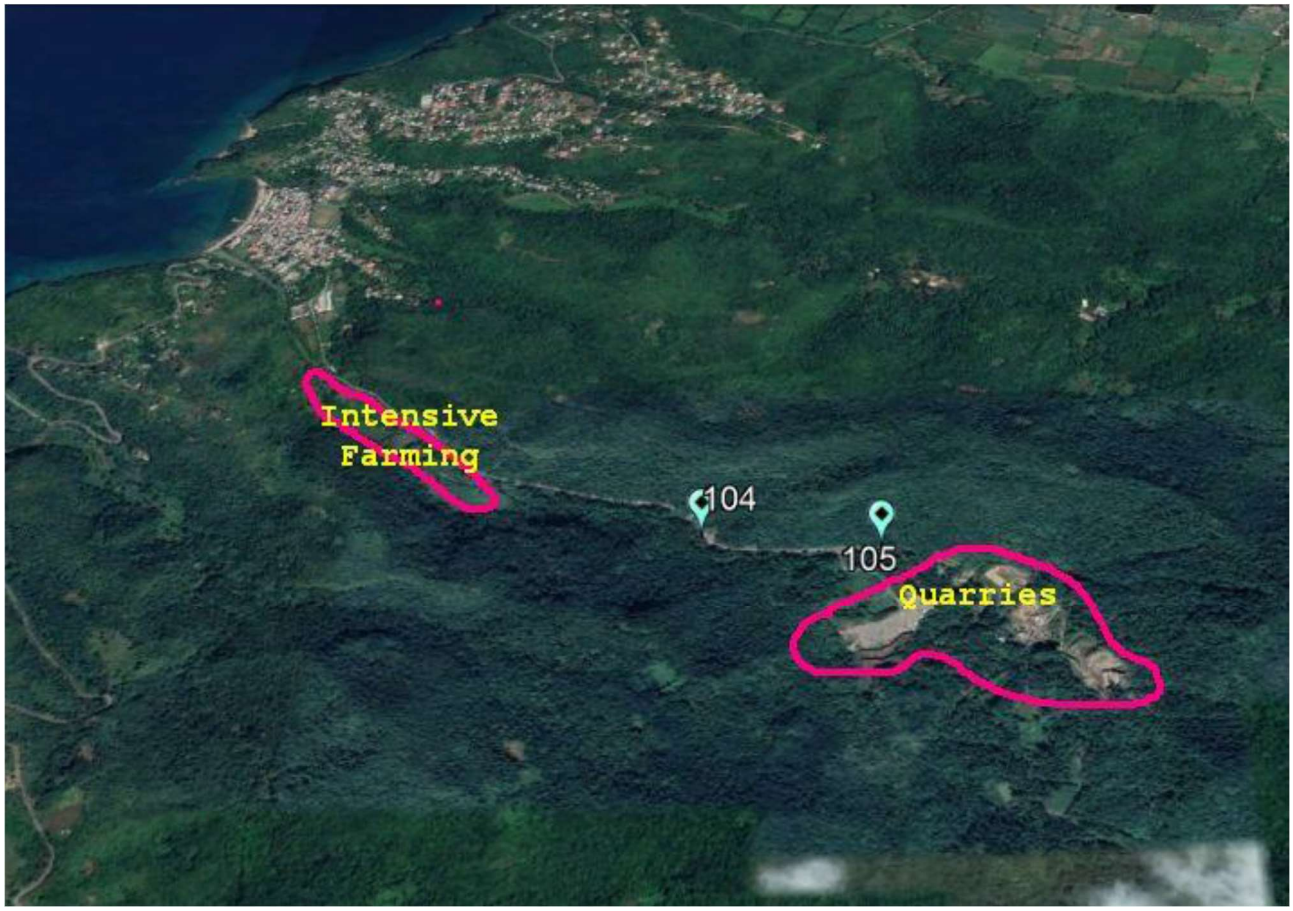

Figure 39 Western Part of Road, Showing Position of Plots 104 And 105.

4.9.3 Survey Methodology:

The area was sampled by traversing on foot along the site for the existing road which included all habitat types within the study area. Plant species at those sites were recorded with particular attention paid to large and dominant trees. Vegetation classes were assessed using the consultant's 2009 report The Classification of the Vegetation of Saint Lucia, part of the National Forest Demarcation and Bio-physical Inventory Project. In addition the main survey lines in the area were used as transect lines to survey the vegetation to. All plants species observed were noted and included are included in **Appendix2.**

4.10 Floristic analysis

4.10.1 Vegetation Classes

Three plots were surveyed during the consultant's vegetation classification survey, two (Plots 104 and 105) in the river valley closer to Anse La Raye (Fig.40) and one (Plot 106).on the higher slopes closer to Venus (Fig. 42 and Graveson 2009).

Figure 40. Plot 106 Closer to Venus/Millet Communities.

Plots 104 and 105 were between 20 metres and 50 meters in elevation. The results were amalgamated as the plots are quite geographically close and botanically similar (Table 11).

Two methods were used to analyse vegetation present and assign vegetation classes. One approach was a Two-way Indicator Species Analysis (TWINSPAN) of tree presence and absence. TWINSPAN was originally devised as a Fortran program by Hill (1979). It has become one of the most popular hierarchical clustering techniques for classifying species and samples (plots), organising them into an ordered two-way table or dendrogram (tree diagram). The second approach was a Manual Species and Forest Association Analysis which is explained in detail in the 2009 report. Both approaches led to almost identical conclusions and resulted in the report's vegetation classification system.

In Saint Lucia there are three main vegetation classes:

- **Deciduous Seasonal Forest** is defined as deciduous because the taller trees tend to lose all their leaves in most dry seasons, although the smaller trees and shrubs are evergreen. Its overall appearance during a normal dry season is of a more or less leafless canopy. There is no moss or cover of ground ferns. It reaches to the coast and as high as 700m on Petit Piton

- **Semi-evergreen Seasonal Forest** occupies the zone between Deciduous Seasonal Forest and Lower Montane Rainforest. It is characterized by upper canopy trees with rather thin, often broad, and quite often compound leaves, which may lose some, but not all, of their leaves during a dry spell. Elevation ranges from almost sea-level in ravines to the summit of Gros Piton.

- **Lower Montane Rainforest** merges with Semi-evergreen Seasonal Forest at lower elevations. Trees are evergreen because there is no water deficit most years in any month. Tree ferns and Heliconias are often present along with a fern and herbaceous ground. Epiphytes are often common.

Analysis of the plot data revealed that **Semi-evergreen Seasonal Forest** is present along the river valley. This is typically found close to lowland river valleys (riparian vegetation) and has been destroyed in most parts of Saint Lucia particularly by intensive banana farming. Anse la Raye valley, although somewhat disturbed by small scale agriculture, has managed to retain its biodiverse riparian vegetation right up to the side of the road. Thus this valley is an important reserve of this beautiful lush vegetation class, of which so much has been destroyed in Saint Lucia.

Table 6 Data from Plots 104 and 105.

Family	Botanical Name	Local Name	Habit	Status
Anacardiaceae	*Spondias mombin*	Hog plum	Tall tree	Naturalized
Arecaceae	*Aiphanes minima*	Gwi-gwi	Palm tree	W. I. endemic
Faboideae	*Andira sapindoides*	Anjlen	Tall tree	Indigenous
Araceae	*Anthurium cordatum*	Sidjinn	Herb	Indigenous
Burseraceea	*Bursera simaruba*	Gonmyé modi	Tall tree	Indigenous
Mimosoideae	*Calliandra tergemina*	Bwa patat.	Shrub	Indigenous
Calophyllacea	*Calophyllus antillana*	Galba	Tree	W. I. endemic
Moraceae	*Castilla elastica*	Rubber tree	Tree	Naturalized
Urticaceae	*Cecropia*	Bwa kannon	Tall tree	W. I. endemic
Sapotaceae	*Chrysophyllum*	Bwi. Bwi kayamit.	Small tree	Indigenous
Polygonaceae	*Coccoloba swartzii*	Bwa lanmowi.	Tee	Indigenous
Arecaceae	*Cocos nucifera*	Koko. Coconut	Palm tree	Cultivated
Boraginaceae	*Cordia collococca*	Sip	Tree	Indigenous
Boraginaceae	*Cordia sulcata*	Sip blan	Tall tree	W. I. endemic
Sapindaceae	*Cupania americana*		Tree	Indigenous
Myrtaceae	*Eugenia oerstediana*	Bwa di bas gwi	Tall tree	Indigenous
Malvaceae	*Guazuma ulmifolia*	Bwa lonm	Tree	Indigenous

Family	Botanical Name	Local Name	Habit	Status
Heliconiaceae	*Heliconia caribaea*	Balizyé	Herb	W. I. endemic
Mimosoideae	*Inga ingoides*	Kakoli	Tall tree	Indigenous
Mimosoideae	*Inga laurina*	Pwa dou	Tall tree	Indigenous
Poaceae	*Lasiacis divaricara*	Ti banbou.	Bamboo-like	Indigenous
Anacardiaceae	*Mangifera indica*	Mango	Tall tree	Naturalized
Araceae	*Monstera andersonii*		Vine	Indigenous
Myrtaceae	*Myrcia deflexa*	Bwa kwéyòl	Tree	Indigenous
Myrtaceae	*Myrcia splendens*	Bwa di bas.	Small tree	Indigenous
Poaceae	*Olyra latifolia*		Bamboo-like	Indigenous
Rubiaceae	*Palicourea croceoides*	Bwa kilibwi	Small tree	Indigenous
Myrtaceae	*Pimenta racemosa*	Bwaden. Bay leaf.	Tall tree	Indigenous
Piperaceae	*Piper dilatatum*	Malenbé. .	Shrub	Indigenous
Polygalaceea	*Securidaca*	Easter vine	woody vine	Indigenous
Bignoniaceae	*Tabebuia*	White Cedar.	Tall tree	W. I. endemic
Apocynaceae	*Tabernaemontana*	Bwa let	Small tree	W. I. endemic

Malvaceae	*Theobroma cacoa*	Cocoa. Kako.	Tree	Cultivated

Key. W. I. endemic = West Indian endemic

Plot 3 was at a much higher elevation (270 m.) and on steep slopes away from the river valley. Analysis of the data revealed that the vegetation class present is Lower Montane Rainforest, typically found in the forest reserve. However it was quite disturbed with evidence of considerable past and present farming and most of the trees were typical of secondary lower montane rainforest

Table 2 Data from Plot 106

Family	**Botanical Name**	**Local Name**	**Habit**	**Status**
Malpighiaceae	*Byrsonima spicata*	Bwa tan	Tree	Indigenous
Urticaceae	*Cecropia scheberiana*	Bwa kannon	Tall tree	W. I. endemic
Polygonaceae	*Coccoloba ascendens*		Woody vine	Indigenous
Arecaceae	*Cocos nucifera*	Koko. Coconut.	Palm tree	Cultivated
Cyathaceae	*Cyathea arborea*	Fwijè	Tree fern	Indigenous
Cyathaceae	*Cyathea grandifolia*	Fwijè	Tree fern	L. A. endemic
Chrysobalanaceae	*Licania leucosepala*		Tree	Indigenous
Faboideae	*Lonchocarpus heptaphyllus*	Savonnèt gwan fey	Tree	Indigenous
Melastomataceae	*Miconia furfuracea*	Bwa kòt	Small tree	L. A. endemic
Melastomataceae	*Miconia mirabilis*	Bwa kòt	Small tree	Indigenous
Melastomataceae	*Miconia racemosa*		Shrub	Indigenous
Myrtaceae	*Myrcia deflexa*	Bwa kwéyòl	Small tree	Indigenous
Lauraceae	*Nectandra membranacea*	Lowyé sann	Tall tree	Indigenous

Family	**Botanical Name**	**Local Name**	**Habit**	**Status**
piperaceae	*Piper dilatatum*	Malenbé	Shrub	Indigenous
Sapotaceae	*Pouteria multiflora*	Pennépis	Tall tree	Indigenous
Arecaceae	*Prestoea acuminata*	Palmis	Palm tree	W. I. endemic
Malvaceae	*Sterculia caribaea*	Mako kochon	Tall tree	L. A. endemic
Symplocaceae	*Symplocos martinicensis*	Bwa blé. Zolivyé.	Tree	Indigenous
Myrtaceae	*Syzygium jambos*	Ponm woz	Tree	Naturalized
Orchidaceae	*Vanilla planifolia*	Vanilla	Vine	Cultivated

Key. W. I. Endemic = West Indian endemic. L.A. endemic = Lesser Antillean endemic

In summary, roadsides at lower elevations were covered by a biodiverse riparian **Semi-evergreen Seasonal Forest** transitioning to a secondary **Lower Montane Rainforest** at higher elevations. No Deciduous Seasonal Forest (dry forest) was observed along the roadsides.

4.11 Species of Interest

Species of interest comprise endemic species, very rare and endangered species. As explained above Semi-evergreen Seasonal Forest is a threatened vegetation class in Saint Lucia. Thus several species found in the Grande Riviere Valley are of interest. Details of all species can be seen on the consultant's website, www.saintlucianplants.com

This valley is very rich in epiphytic orchids with approximately 20 species present. Neglected stands of citrus trees are extremely rich in epidendrums and other orchid species. *Ionopsis utricullariodes* is an extremely rare orchid found close to La Sikwi Sugar Mill 9 (Fig 41). *Andira inermis* is a beautiful tree found very close to lowland rivers. It is found in Grande Riviere Valley but is now rare in Saint Lucia due to habitat loss and exploitation for timber.(Fig 42). *Sicydium tamnifolium* is an extremely rare delicate vine, found on roadside cliffs closer to Venus (Fig 43).

A rare Saint Lucia endemic Acalypha elizabethae, is also found on roadside cliffs closer to Venus. This species thrives in semi-open wet spots (Fig. 42).

A tall Myrtaceae tree common in Grande Riviere Valley, very rare elsewhere (Fig. 44). Monstera andersonii is a very common vine in Grande Riviere valley , very rare elsewhere in Saint Lucia (Fig. 45). It should not be confused with a similar invasive vine Epipremnum pinnatum which has yellow and green leaves. Several bamboo-like grasses are found along the road. Olyra latifolia ia rare species. (Fig.46). Stigmaphyllon puberum is an extremely rare woody vine in Saint Lucia but is not uncommon close to the Grande Riviere River in the quarry area. (Fig. 47). The *Acalypha elizabethae* occurs along the roadside through to Venus.

Figure 81 ***Ionopsis utricularioides.***

Figure 92 *Andira inermis*, Anjlen.

Figure 43 *Eugenia oerstediana*, Bwa di Bas Gwi.

Figure 10 *Monstera andersonii,* Swiss Cheese plant.

Figure 45 *Olyra latifolia.*

Figure46 *Stigmaphyllon puberum.*

Figure 47 *Acalypha elizabethae*

For this project study, the species of conservation concern are listed below in table 13. This is to assist in identification as part of the management effort to ensure road construction that does not adversely affect the surrounding ecosystem in a significant way,

Table 8. Species of Conservation

Family	Botanical Name	Habit	Status
Araceae	*Monstera andersonii*	Vine	Indigenous
Cucurbitaceae	*Sicydium tamnifolium*	Terrestrial herb	Indigenous
Euphorbiaceae	*Acalypha elizabethae*	Shrub	Saint Lucian Endemic
Faboideae	*Andira sapindoides*	Tree	Indigenous
Malpighiaceae	*Stigmaphyllon puberum.*	Vine	Indigenous
Myrtaceae	*Eugenia oerstediana*	Tree	Indigenous
Orchidaceae	*Epidendrum nocturnum*	Epiphytic herb	Indigenous
Orchidaceae	*Epidendrum strobiliferum*	Epiphytic herb	Indigenous
Orchidaceae	*Ionopsis utricularioides*	Epiphytic herb	Indigenous
Poaceae	*Olyra latifolia*	Terrestrial herb	Indigenous

The roadside is rich in epiphytic orchids some of which are very rare and are listed in Table 13. Only some tree species support epiphytic orchids and where orchid growth is observed that tree should be conserved when possible.

Any specimens of the very rare endemic Acalypha *elizabethae* should be conserved, along with the other rare woody species listed in Table 1.

Rare terrestrial herbs, *Olyra latifolia* and *Sicydium tamnifolium* cannot be conserved but will appear where suitable natural conditions are maintained.

It will be essential to have a field botanist on hand to teach the construction team on the identification of these species.

4.12 Summary Impact on Flora and Fauna

For the Impact significance rating, apply the Quantitative and qualitative methods that were used in determination of the significance of impacts.

Potential impacts were ranked in terms of significance to determine whether each impact is acceptable, requires mitigation or is unacceptable.

The criteria for evaluation of magnitude of environmental and social impacts has been categorised in terms of:

- **Extent is a spatial impact:** evaluates the area of influence on the environment;
    1. on the site, (within 1 km radius of the site)
    2. locally (within 5 km radius of the site);
    3. regionally (district, nationally or internationally).

- **Persistence is a temporal impact:** evaluates the lasting effect of impact on environment
    1. temporary during construction only;
    2. medium term (5 – 10 years or lasting after construction has been completed);
    3. long term (>10) or permanent.

- **Intensity: is** the quantifiable effects of impacts, at (Scale of 1 -3; Low , Medium or High).

- **Magnitude** is the combined effects of intensity, duration, frequency of occurrence of event or impact, and anticipated extent of impact.

- **Probability:** Evaluates the likelihood of occurrence of predicted impact on the subject environment on a likert scale (Very Unlikely, Unlikely, Likely, Certain,

  Definite)

Likelihood	**5 – Certain**	Almost certain to occur in most circumstances
	4 - Likely	Likely to occur frequently
	3 - Possible	Possible and likely to occur at some time
	2 - Unlikely	Unlikely to occur but could happen
	1 - Rare	May occur but only in rare and exceptional circumstances

Overall Impact Significance: A product of **sensitivity and Magnitude** and is assigned a rating of Low, Medium or High.

Type of Impact: Categorises into direct, indirect or cumulative effects of the specific impact.

Direction: Negative or Positive

Reversibility: Irreversible or Reversible

The tabulated summary of all impacts is presented followed by a discussion of impacts anticipated, mitigation or enhancement measures proposed

Table 9 Impact significance rating on Flora and Fauna

Component	Impact	Source of Impact	Probability of Occurrence (L.M H)	Receptor	Magnitude				Overall significance		
					Frequency	Duration	Extent	intensity	Receptor sensitivity	Magnitude	Impact significance
Fauna	Change in species population, abundance, distribution	Clearing Forest vegetation Introduction of barriers to movement	H	Mammals reptiles. birds	1	2	2		1	Medium (2)	Medium (6)
	Disruption/ disorientation by noise	Use of motorized equipment	H	Mammals reptiles. birds	1	2	2		1	Medium (2)	Medium (6)
	Unintentional kills	Ground disturbance	H	Small mammals reptiles	1	2	2		1	Medium (2)	Medium (6)
	Increase risk to human and wildlife conflict	Alienation of wildlife in their natural habitat, specifically, the Saint Lucia Fer de lance, due to increase hazard to human and birds becoming pest to farmers	H	Reptile (snakes) mammals and birds	1	2	2		1	High	High

		and other future potential landuse change									
	Wildlife prosecution & Road Kills	Deliberate harm and killing and ~~U~~use of motorized equipment Human presence	H	Large Mammals reptiles Ground dwelling birds	1	2	2		1	Medium (2)	Medium (6)
	Habitat loss and degradation	Fragmentation of habitat and loss of food source due to direct, during construction and increase in opportunity for change in land use)	H	Birds, reptiles and mammals	2	3	2		1	Medium	Medium (6)
	Deteriorated quality of surface water	Use of chemical substances Chemical spills	M	Reptiles amphibians, fish	1	2	2		1	Medium (2)	Medium (6)
	Introduction of alien invasive species	Increase pathway for alien invasive species, reptiles, a major threat to biodiversity in Saint Lucia. These include the inter alia mammals, cats, dogs, pigs mongoose, rats ect.	H	native birds, reptiles, mammals, insects	1	2	2		1	high	High
	Deteriorated quality of soil Increased risk of diseases spread to fauna	Use of chemical substances Human presence	M	Reptiles amphibians small mammals large mammals	1	2	2		1	Medium (2)	Medium (6)

	Increased risk of diseases spread to fauna	Presence of humans sanitation and waste management	M	Large mammals, Birds, fish	1	2	2		1	Medium (2)	Medium (6)
Flora	Change in species population,	Clearing Forest vegetation Poor management of invasive species	H	Forest edge species	1	2	2	1	Medium (2)	Medium (6)	Medium negative
	Increased risk of wildfire	Deliberate for land clearing and tossing of cigarettes and other combustive agents	H	All vegetation and general biodiversity	1	2	2	1	1	Medium	Medium
	Habitat modification	Opening canopy	H	All vegetation	1	2	2	1	Medium (2)	Medium (6)	Medium negative
	Proliferation of invasive species	Proliferation of invasive species	H	All vegetation	1	2	2	1	Medium (2)	Medium (6)	Medium negative
	Deteriorated quality of surface water	Use of chemical substances	M	All vegetation	1	2	2	1	Medium (2)	Medium (6)	Medium negative
	Reduce climate change adaptation and mitigation potential	deforestation and forest degradation activities contributing to reduce resilience to the vagaries of climate change and increase in the release in green house gasses	M	All forest	3	2	2	3	3	low	low
	Deteriorated quality of soil	Use of chemical substances	M	All vegetation	1	2	1	2	Medium (2)	Medium (6)	Medium negative

		Human presence									
Geology and soil	Contamination of soil	Waste management Operation of machinery Vehicle/ machinery repairs	H	Soil, Plants and animals dependent on soil Ground water	1	2	1	3	Medium (2)	Medium (7)	Medium Negative
	Changes in physical chemical properties (temperature, oxidation, aggregation)	Opening canopy Clearing vegetation	H	Soil Plants and animals dependent on soil	1	2	2	2	Medium (2)	Medium (7)	Medium Negative
	Erosion	Vegetation clearing	H	Cultivated areas Communities Surface water	1	1	2	2	Medium (2)	Medium (7)	Medium Negative
Atmosphere	Increased levels of particulate matter (dust)	Excavation and road works	H	Workers Community Plants and animals	1	2	1	3	Medium (2)	Medium (7)	Medium Negative
	Deteriorated quality due to emissions of gaseous pollutants	Operation of vehicles & equipment Construction chemicals	H	Workers Community Plants and animals atmosphere	1	2	2	2	Medium (2)	Medium (7)	Medium Negative
	Increased levels of noise	Excavation and road works Movement of vehicles Operation of equipment	H	Workers Community Wildlife,Domestic animals	2	1	1	2	High (3)	Medium (6)	Medium Negative

Water resources	Changes in physical chemical properties (Contamination , sedimentation)	Waste management Operation of machinery Vehicle/ machinery repairs	M	Aquatic fauna and flora Wildlife and human Water users	1	2	2	3	High (3)	Medium (8)	High Negative
	Changes in fish populations (mortality, destruction of spawn sites, blockage of passage)	Blockage of water courses Sedimentation Erosion Water contamination	M	Aquatic fauna and flora Wildlife and human Water users	1	2	2	3	High (3)	Medium (8)	High Negative
	Changes in hydrology/ drainage	Inappropriate culvert size or placement Blockage of water course	L	Cultivated lands, buildings along road, Wildlife	1	1	1	2	Medium (2)	Low (5)	Medium Negative

4.13 Recommendations

The floral analysis shows that the sides of the road from Anse La Raye to Venus is very botanically biodiverse with the presence of many species very rare elsewhere in Saint Lucia. This is particularly true of the lower elevations which have a rich riparian semi-evergreen seasonal forest cover. However the upper elevations are also of interest particularly with the presence of the rare Saint Lucia endemic, Acalypha elizabethae.

Thus road construction and improvement should minimize any vegetation clearance so as to safeguard this biodiversity. In addition, this road was an important eco-tourist destination and much of the charm was the closed-in "jungly" nature of the valley. Clearance will dramatically reduce this visual impact.

Furthermore tree vegetation is very important at lower elevations as it reduces damage to the road cause by flooding. At higher elevations where the slope on both side of the road is very steep, clearance will result in landslides which in turn will damage the road.

Common sense thus indicates that vegetation clearance is not a good idea and that if the wet and shady nature of the road cause problem with a particular road surface, then that surface should be changed rather than the roadside environment be destroyed.

The roadside is rich in epiphytic orchids some of which are very rare and are listed in Table 1. Only some tree species support epiphytic orchids and where orchid growth is observed that tree should be conserved when possible.

Any specimens of the very rare endemic Acalypha *elizabethae* should be conserved, along with the other rare woody species listed in Table 1.

Rare terrestrial herbs, *Olyra latifolia* and *Sicydium tamnifolium* cannot be conserved but will appear where suitable natural conditions are maintained.

It will be essential to have a field botanist on hand to teach the construction team on the identification of these species.

SECTION 5

PROJECT ROAD DESIGN AND WORKS DETAILS

5.1 Introduction

This section provides detailed information on the proposed road design and works details.

5.2 Design Considerations

The road is required to be designed to incorporate improvement in the carriage way, furnishings, drainage, access for pedestrians including cyclists, tourist viewpoints, bus stops and laybys. During the design process the Client expects to give consideration to the options of all infrastructure including drainage infrastructure (drains, culverts & bridges), roadway, pedestrian access and retaining structures.

Indicative design parameters for Class II paved roads are outlined in Table 6. The road design has been optimised to incorporate mitigation measures in order to reduce the impact on the environment, particularly right of way and design speed as presented in the following sections

Table 10 **Geometric Design Parameters for Tertiary roads**

Design Element	**Proposed**			**Reference (AASHTO 2011)**
Terrain (F – Flat, R – Rolling, M – Mountainous)	F	**R**	**M**	
Design speed in KPH	40	30	20	
Super elevation		**Maximum 5%**	Ch. 3.3.3 / Page 3-29	

Minimum horizontal radius (m)	43	21	8	Table 3-7/ Page 3-32
Minimum length of the horizontal curve (m)	-	-	-	Table 3-14/ Page 3-58
Radii beyond which spirals are not required (m)	95	54	24	Table 3-20/ Page 3-71
Desirable length of spiral (m)	L=22	L=17	L=11	Table 3-21/ Page 3-73
Runoff length	runoff to be accomplished over the entire length of the spiral	Table 3-17a/ Page 3-64		
Run out length (minimum)	7	-	-	Table 3-23/ Page 3-75
Stopping Site Distance				
- At level ground	50	35	20	Table 3-1/ Page 3-4
- On downgrades (3%/9%)	50/53	32/35	20/20	Table 3-2/ Page 3-5
- On upgrades (3%/9%)	45/243	31/29	19/18	Table 3-2/ Page 3-5
Passing Sight Distance	145	120	100	Table 3-4/ Page 3-9
Maximum vertical grade	8% to 12%* **(*) subject to increase if justified**	Ch. 3.4.2 / Page 3-113		

Minimum vertical grade	**0 to 0.30% subject to the terrain. Avoid 0% in horizontal transition sectors**	Ch. 3.4.2 / Page 3-113		
Rate of CREST vertical curvature K (L/A)	4	2	1	Table 3-34/ Page 3-155
Rate of SAG vertical curvature K(L/A)	9	6	3	Table 3-36/ Page 3-161
Widening	-	Table 3-26a/ Page 3-93 Table 3-27/ Page 3-96		

5.3 General Design Considerations for Road Elements

The following represents the general consideration given to the design of the road elements.

Table 11 General Design Considerations for Road Elements

Design Element	Description
Carriageway	2 x 2.75 m + widening where necessary
Shoulder/Pedestrian walkway/Laybys	Pedestrian walkway on one side in residential areas as a safety feature. Shoulder on the opposite side Other areas gravel shoulder on one side Laybys in scenic areas
Verge	No verge
Side Slopes in cut	1.5V:1H (or 1V:1H) with Bench of 3.0m/10% slope at unstable areas every 5.0m height
Side Slopes in fill	1V:1.5H with bench of 3.0m/4.0% slope at every 5.0m height

Drainage	Concrete lined drains on one side of road in areas with grades less than 10%. On steeper grades drains on both sides. Circular concrete pipes with a minimum diameter of 900mm. Concrete box culverts for watercourses. Subsurface PVC filter pipes wrapped in geotextile material for areas where necessary
Retaining Walls	Gabion Baskets or Reinforced concrete based on localised condition.
Pavement	Asphalt pavement on gravel layers in residential areas Reinforced concrete pavement on grades exceeding 10% and areas through the rainforest.
Road Lighting	Stand alone street light powered by photovoltaic panels
Road Signs	Stainless steel with reflective coating

5.4 Road Profiles

Across the project area, the uphill section of the road, large and small displacements of soil are visible. In road construction cross the island, it is commonly found that road construction on steep inclines are constructed by cutting into the up slope above the road and dumping of the excavated materials on the down slope, to form the road embankment. This is typically how the flat horizontal road surface area is obtained in the uphill side of the road. This is illustrated from Figure 4 extracted from the CHARIM "Landslide mitigation Measures for Roads" for illustration.

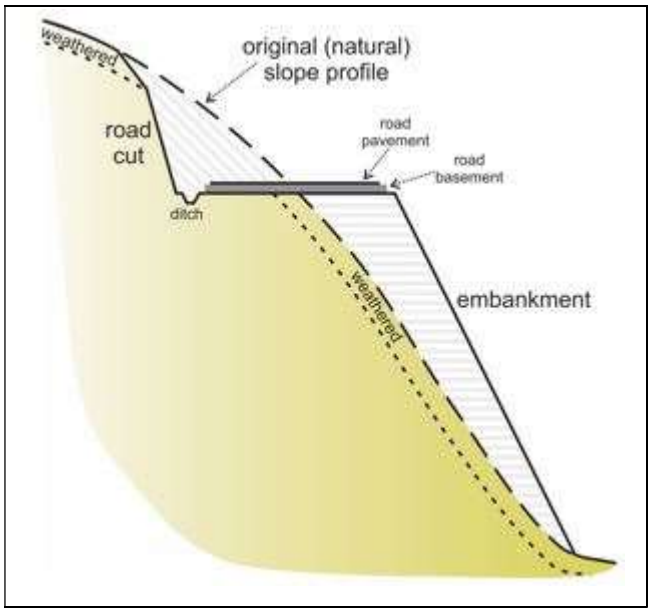

Figure 48 Road construction in mountainous terrain. The material excavated in the road cut is used as fill for the embankment.

5.5 Road alignment

For the most part the current road alignment shall be followed however some realignment has been proposed to upgrade the road to meet DIPE standards for road design particularly in sections where sharp corners, narrow carriageway and slope failures were observed.

Major realignments include:

- 4+100 – 4+170 avoidance of existing landslide
- 5+810 – 6+020 avoidance of landslide

Within forested area the existing canopy is to be maintained during the construction period and any clearance shall be to accommodate carriage way, shoulders and drainage only. The DIPE Engineers prefer that the canopy be cut to allow sunlight onto the road surfaces.

5.6 Pavement Design

The road will have a design period of 20years with predicted traffic of less than 0.5 MESA. Parameters or the wearing course, base, sub base and selected layer are presented in Table 9 below. Due to the high rainfall in the project area, it will be necessary to design pavements which are resilient to these conditions. Structural pavement design must factor in the frequent loads now occurring from the quarry operations in the area. With improvement it the road conditions, these loads will increase both in intensity and frequency. Both asphalt and reinforced concrete pavements will be considered for various road sections.

Table 12 pavement design criteria

Pavement layer	Thickness (mm)	Material
Wearing course/	37-50	Continuously graded asphalt(AC20)
Wearing Course	150-200	Reinforced concrete (30 Mpa)
Base	150-250	Crushed stone base(CRR Fine type)
Subbase	225-300	Cement stabilized (UCS 0.75-1.5 MPa)
Selected layer	300	Granular material(G15)

5.7 Road furniture

5.7.1 Traffic Signs

Traffic signs and road markings are used to regulate, warn, inform or guide road users for the safe, smooth movement of road and pedestrian traffic. Signs conform to the Road Traffic Act.

5.7.2 Road Marking

Road markings may will be used to supplement other traffic signs. There are advantages in the use of road markings given its continued message to the driver. Thus they can be used to guide drivers in the correct positioning of their vehicles for smooth traffic flows and road safely. Road markings in rural areas have limitations in that they get covered up by dirt. Road marking shall be thermoplastic paint which is considerably more durable than road standard paint.

5.7.3 Traffic Management

Speed control is a very important safety measure to prevent traffic accidents given that rural areas have limited sidewalks and frequently have children playing in the roads, pedestrians and parked vehicles along the roadsides.

5.7.4 Drainage

A drainage inventory was at advanced stages of completion during the ongoing road condition assessment. Any blocked, damaged and short culverts will be identified during the inventory and these are to be improved during the road upgrade. Any removed concrete, blocks, or other material will be carefully stored in designated areas from which they will be carted and disposed of appropriately as per SLSWMA requirements.

5.7.5 Slope stabilisation

Existing landslide areas will be stabilized by excavation of the slope and construction of retaining walls. Where unstable areas are located on the top slope, a combination of benching and retaining walls will be used. Bio-engineering techniques will be used to cover exposed soil on slopes. All retaining measures, including possible benching will be close supervised and monitored by the project engineer. Any material removed will be placed in designated storage areas, placed in a stabilized position, and surrounded by secured geotextile fabric to mitigate any potential movement and sediment runoff, especially during rainfall.

5.8 Prioritization of the Planned Interventions

One of the possibilities of the road rehabilitation is a set of strategic interventions at specific road location rather than holistic improvement of complete road sections. Each specific intervention may entail distinct environmental mitigation measures which can only be full determined on completion of the preliminary designs. The matrix in Table 13 was developed to prioritize all considerations for the design of the rehabilitation scheme. Four functional areas have been identified by the consultant as critical to having a well-engineered project.

1. Provision of **connectivity** is seen as the most important requirement based on the TOR and the requirements of the community and other stakeholders. Commuters should at all times be able to navigate from one end of the road to the other.

2. Road **safety** is considered the second priority.

3. **Resilience** of the road is critical to the long-term viability of the investment.

4. **Serviceability** pertains to the quality of what is provided to the end user.

Potential impacts arising from functional areas are identified in the table and with weighting being assigned to the probability of the impact, its magnitude and the associated risk of taking no action during the rehabilitation of the road. Suggested mitigation measures for potential impacts are provided and a cost will be developed for each potential mitigation measure. By use of the matrix, along with the economic analysis, the Client will be in a position to determine the most suitable rehabilitation scheme based on the resources available.

5.9 Project Activities

The road upgrade project will involve a number of activities from project initiation through to commissioning. The key project activities will include land acquisition and compensation, bush clearing and earthworks, cut and fill, borrow pits, construction of workers' areas, equipment maintenance, extraction of construction materials, processing and transportation of construction materials, transportation of wastes, road compaction and paving.

5.9.1 Pre-construction Activities

Construction works are expected to commence in the second half of 2020 in order to have the road completed well by June 2021. TEAMS Inc. has undertaken the Environmental and Social Impact Assessment and is simultaneously undertaking studies to manage impacts associated with land take or destruction of property.

5.9.2 Construction Phase

Materials to be required by the project include but are not limited to

- Gravel
- Stone aggregate
- Sand
- Cement
- Form work
- Asphalt
- Water
- Oil

Road construction will entail procurement or extraction of materials and their haulage from sources to road sites. This is to be done by the contractor.

Table 13 Intervention Prioritization Matrix

Vanard (Venus) to Anse La Raye Link Road Rehabilitation
Intervention Prioritisation Plan

1			1			1			Low
	2			2			2		Medium
		3			3			3	High

No.	Component	Situation Description	Possible Impact	Probability of Impact			Magnitude of Impact			Risk (do nothing)			Priority Weighting	Mitigation	Mitigation Cost	Notes
1	Connectivity	Landslides undermining carriageway.	Carriageway Collapse - Road impassable			3			3			3	9	Stabilise slopes with well engineered retaining structures incorporating bioengineering measures.		
		Debris flow/avalanche blocking carriageway	Road impassable due to debris blocking carriageway			3			3		2		8	Stabilise slopes with well engineered retaining structures incorporating bioengineering measures.		
2	Safety	Poor forward visibility at bends	Vehicle collisions	1				2		1			4	Cut back verges and replant with suitable vegetation.		
		No pedestrian accommodation	Loss of Life/Severe injury			3			3		2		8	Provide adequate sidewalks and road crossing facilities where demand		
		Slippery pavements	Loss of Life/Severe injury	1				2			2		5	Introduce measures to optimise traction on existing and new pavement surfaces.		
		No Safety barriers where hazards exist	Loss of Life/Severe injury		2				3			3	8	Provision of safety barriers		
		No roadmaking or signage	Veh./Veh. and Ped./Veh. Conflict. Hazard notification			3		2		1			6	Provide road marking and Signage		
		Poor lighting	Crime/Personal injury		2			2				3	7	Provide street lighting		
3	Resilience	Bituminous pavements	Requires greater maintenance input; more susceptible to damage due to flooding			3			3			3	9	Provide concrete pavements at optimal locations		
		Inadequate Drainage infrastructure	Failures causing erosion, scour and siltation; infrastructure damage.			3			3			3	9	Upsize culverts to accommodate increased flow volumes and poor maintenance. Introduce bioengineering measures to reduce siltation along drainage infrastructure		
		Slope stability	Slope failure, landslides, infrastructure damage, erosion, soil loss and siltation.			3			3			3	9	Bioengineering/soft engineering measures on slopes identified as being at risk		
4	Serviceability	Potholing and generally poor road surface (localised areas)	High road user cost			3			3			3	9	Pavement rehabilitation		
		Poor Aesthetics	Poor perception of areas; unattractive for touristic activity			3	1			1			5	Planting; removal of derelict vehicles		
		Nonextant laybys and bus shelters	Inconvenient and unsafe			3		2			2		7	Construct laybys and bus shelters at appropriate locations		

Potential sites for materials extraction have not yet been identified at this stage but will be subjected to separate environmental impact assessment. There is pumice/subbase and crushed stone/base located along the areas bordering the proposed road.

5.10 Civil works

Civil works on the road shall include scarification of the current surface and improvement of the carriage way. The standard road dimensions shall be a 5.5m carriage way and two 1.5m shoulders. Basically it is anticipated that ground breaking and stripping works shall result in excavations estimated at 4000 m3 of soil. Activities anticipated during the civil works include

- Scarification of existing paved surface and its removal
- Clearing vegetation and stripping off topsoil for at least and stockpiling of waste soil and vegetation
- Removal of Stockpiled soil and vegetation
- Excavation
- Laying of the road foundation (fill and backfill)
- Compaction of the foundations
- Transportation of materials to site
- Mixing and laying of requisite materials for sub base and base course
- Preparation of hot asphalt mix
- Spreading of hot asphalt mix for the road riding surface
- Additional courses of bitumen and asphalt will be laid according to engineers' specifications)
- Compaction and finishing of hot asphalt using rollers
- Testing the surface
- Traffic control during construction

- Road marking and installation of signs and other furniture

5.11 Project Resources

5.11.1 Equipment

Equipment used in road construction include but are not limited to dumper trucks, excavators, graders, compactors. Most of these are heavy equipment and some are vibratory (especially those used in compaction).

5.11.2 Human resource

Employment of labour is anticipated to include skilled and non-skilled. The anticipated of human resource includes Civil engineering, skilled and unskilled labour, equipment operators, laboratory testing technicians, project administrators and project managers among others. Typically about 50-80 people are proposed to be employed. It is likely that local residents shall mostly be employed to do casual jobs depending on their skills set.

5.11.2 Worker and storage areas

It is expected that, the construction workforce including contractor and resident engineer will establish worker and storage sites along the road sections as necessary. In general, such sites or workers' areas will require approximately 1-2 acres of land and will consist of water supply structures, kitchens and areas for serving meals, sanitation facilities and access roads. These will be areas on or near the project where the contractor may store or hoard materials, have water, first aid stations for worker welfare, parking and other required facilities.

The Contractor will enter formal lease agreements with the landowners prior to the construction of these sites. In setting up the workers areas and storage sites, consideration will be given to water availability, waste management, security within the designated area, access routes, and land availability.

5.11.3 Borrow Pits and Quarry sites

A number of potential sources of materials for the construction of the road were identified. Designated borrow pit areas will be identified during the stages of the detailed design work. Existing sites will be investigated and where these are not available new sites may have to be established if feasable. Materials will also be sourced from local operating quarries that meet the required technical standards of the material required.

While there are existing quarries and borrow areas, there may be a tendency to not utilized these in order to assist in ensuring slope stability as well as consistency of material to be used. Further quarrying into borrow pits or disused quarries may act as facilitators of land slides especially if the quarried areas were not properly benched or mined in the first place undermining the cut face or the land around it.

Nearby existing legal quarry operations may be sourced for the appropriate material for the project. Any quarry operation that will be approached will be subject to the appropriate due-diligence by the appropriate agency to ensure they are reputable and licensed. The basis of this is to ensure the quality of material and the processes that provide the material, as well as to discourage illegal quarrying activity.

Transportation of any material by haul trucks will have to be under conditions that ensure safety procedures are employed along the route from source of material to the site. These will include but not be limited to the hauling of materials during approved daylight work hours, no overfilling of haul trucks, the covering of all materials in the trucks by tarps, no excessive speeding on community roads, the diligent use of horns to work of the approaching loaded trucks, the dumping of materials in a designated secure work area on the project site.

5.12 Post Construction phase

The post-construction phase refers to the time after construction has been completed and the upgraded road has been commissioned for operations. This period involves operations of the road and scheduled maintenance activities carried out by DIPE to maintain the quality of the infrastructure over time. This work will include attending to the road surface, maintain drains, as well as reducing overhanging trees and vegetation over the road.

SECTION 6

SOCIAL AND ECONOMIC ASSESSMENT

6.0 Introduction

This social assessment section provides a demographic, social, and economic overview of the impacted community of Anse la Raye. This forms the basis for the social survey and determination of potential social impacts of the road project on the community.

6.1 The local Community Overview

The road traverses through the community of Durandeau which is a rural subsistence farming community along the road to Venus and Millet. Durandeau is largely a linear rural settlement defined along the connecting road between Vanard and Millet. The total settlement population at last census (2010) was approximately 400 households. It is predominantly a quiet community, with the main economic activities limited to subsistence agriculture, residential dwellings and a scattering of mixed residential/commercial (retail grocery shopping) use and quarry mining operations (stone and pumice) and farm supplies facility.

The rural economy of the district and this area in particular is dependent upon agriculture. In addition, the area offers nature tourism and spin off vending opportunity to some of its households.

Bird watching enthusiasts may be drawn to the Millet Bird Sanctuary Trail, which is a haven for birdlife, with over thirty species found along the trail. In 2009, the Organization of Eastern Caribbean States (OECS) Secretariat used funding from the United States Agency for International Development (USAID) to establish a modern interpretative centre, an inventory of biodiversity, and characterization of human assets in the Millet Tete Chemin community. The St. Lucian Parrot can be seen on any given trail in the Millet Bird Sanctuary and Interpretation Centre. This nature trail is one of the best maintained on the island with 1.5 metres radius clearance on both sides on both sides of the trail to increase the visibility of the presence of the poisonous Fer de lance snakes that are found in the area.

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6.2 The Anse La Raye Community

Anse la Raye is a village on the west coast of the island, about 20 minutes drive from the capital, Castries. In 2016, the population of the region was 6,247, and they are mainly fishermen and agricultural workers. Anse La Raye has its reputation as a beautiful island village where many of the buildings are over a 100-years old and provide good examples of French and English colonial architecture. One of the most important attractions in the village of Anse la Raye is the Roman Catholic Church. The church records in Soufriere which are the earliest on the island show that a chapel existed in Anse la Raye as early as 1762. The Anse la Raye register begins in 1765 and the priest at that time was Abbe Devalladares and the church was dedicated to the Nativity of our Lady. It is a popular entertainment venue that is known for the weekend street parties (fish fry)which was developed in 1999 with assistance from the Saint Lucia Heritage Tourism Programme (SLHTP, a project funded by the European Union and the Government of Saint Lucia). Advertising brochures show that it is a fun evening with a wide variety of Seafood dishes. The activity at its height supported more than twenty seafood sellers. Figures 49 and 50 show the fishers' boats and the the Friday night Fish fry that result from the fisher's catch.

Figure 49 Anse la Raye sea front with fishing vessels

Figure 50 **Anse La Raye fish fry**

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Anse La Raye offers a wide variety of dive options, equipment rentals, and as always, maintains the highest standard of safety. There are established touristic operators in the area such as Ti Kaye Diving and Island Divers. The Ti Kaye Resort & Spa is located on the secluded Anse Cochon cove alongside the fishing village of Anse La Raye. The efforts of Anse-la-Raye event provides a defining characteristic of the St. Lucia tourism product.

The 2017 records show that there are 156 fisher registrations and 25 fishing vessels are registered of which 4 are canoes and 21 are pirogues in the district of Anse La Raye. The Anse La Raye fish fry provides tangible economic benefits to women (in 2004, 72% of ALR vendors were women, who are often single heads of households (61%), and to unskilled persons (83% only primary education). For most of them it is the primary source of income (83% of ALR vendors in 2004).

6.2.1 Anse La Raye Community Groups

Community groups were seen as repositories of key information about the community and its issues and provided a forum that was relevant to the social and economic assessment needed as inputs in the ESIA design process. This informant group included community leaders, community development professionals, and residents with first-hand and historical knowledge about the community. Two community meetings were conducted during Jan 2020. Community members were invited from radio announcements, social media posts and personal invitations from other community groups. At the meetings, a trained facilitator led discussions and names and contact information for all attendees were collected. During meetings, a scripted guide was followed which was adapted to suit the respective organizations interest. These details are further discussed in the consultation section of the report. Community groups that were consulted as part of the process included the following:

1. Anse La Raye Vendors Association
2. Anse La Raye Youth and Sports Council
3. MAC Police
4. Mothers and Fathers Group
5. Anse La Raye Council of the Disabled
6. Anse La Raye UK Committee
7. Anse La Raye Club 60
8. Foundation Sports and Cultural Club
9. All Stars Sports Club
10. Young Stars Sports Club
11. Lion Hearts Sports & Cultural Club
12. Fishermen's Cooperative

6.2.2 Education

Literacy is one of the basic indicators of economic development. The district of Anse La Raye is served by 3 day care centres with a total enrollment of 159 students. The Millet day care centre serves 38 children. There are 87 students enrolled at the millet Infant school and 98 students enrolled at the Millet Primary school, with female enrollment at 45%. The Anse La Raye Infant and Primary school have 73 and 119 respectively, with female enrollment standing at about 47%. The schools all operate below 50% capacity. On average about 90% of the infant and 60% of the primary school students benefit from the school feeding program. 17.8% of the Anse La Raye Infant and 9.2% of the primary school students benefit from bursaries and the figures for Millet is 41.4% and 21.4% for the Infant and primary schools respectively. The average for Common Entrance Examinations performance of the district schools Anse La Raye Primary was 62% and Millet primary 74%. The Millet school is a better performer.

Anse La Raye

According to the 2010 Population and Housing census 45.9 % of the population of Anse La Raye attained pre-primary., 18.7 % Upper secondary (forms 4 and 5) and post-secondary (non-tertiary) and 12.9% of the population attested to having no form of education. A vast majority of the population of Anse La Raye had no form of certification (73.5%) while 10.9 % possess O Levels of CXC passes.

Vanard

As it relates to Vanard a vast majority of the population agreed to attaining Pre-primary (Infant) or Primary (43.8%), Lower/Junior Secondary/Senior Primary (13.9%) and Upper secondary (forms 4 and 5) and post-secondary (non-tertiary) (19.8%). For Vanard 70.8% of the population stated that they had no form of certification while 11.9 % possess O Levels of CXC passes.

Venus

For Venus, 49.3 % of the population of this community attained Pre-primary (Infant) or Primary level education, 12.8% upper secondary (Forms 4 &5) and 17.6% acquired any form of education (no educational attainment). As if relates to certification for persons from Venus 75.9% of the population had no form of certification, 7% had other forms of educational attainment and 5.8% attained O Levels of CXC passes.

Table 3 Anse La Raye Day care centers enrollment

Anse La Raye	
Centre	Enrolment
Millet	38
Adalyn Leonce ECDC	36
Marigot	27
Total	101

Gros Islet	
Centre	Enrolment
St. Helen's	96
ABC Kindergarten	60
Total	156

Micoud	
Centre	Enrolment

http://www.govt.lc/media.govt.lc/www/resources/publications/digest-2017-pdf.pdf

6.2.3 Irrigation and Farm Supplies

Smallholder agriculture is noted as being low in technology and dependent on rain fed production. This is a particular challenge in areas where seasonal rainfall and increasing climatic variability limit crop production volumes. In such cases, irrigation infrastructure would contribute significantly to improving agriculture growth. Drip irrigation technologies are well developed in more arid island's in the region, however in Anse La Raye communities have little irrigation usage.

The Vanard community is served by the Tropical Farm Supplies company that supplies fertilizers, agro-chemicals and small equipment. This farm supply company has a very far reach with farmer customers from miles away on the east and east coast of the island.

6.2.4 Drinking Water

The community is serviced with reliable drinking water from the national water authority. Potable water is accessed by approximately 95% of the population.

6.2.5 Electricity and Services

The area is served by 240-volt electricity supply and most houses were observed to have access to electricity. The community also has access to internet and cable services. Rural electrification projects in the past have been widespread and have not only provided better living conditions but has also generated employment opportunities in the rural environment.

6.2.6 Banks and Co-Operative Societies

Anse La Raye is served by the West Coast Communities Co-operative Credit Union Society Ltd. The Credit Union Society Ltd opened its doors to the communities on October 6th, 2010, with the mandate to better the lives of members and the communities. Its products and services are extended to all residents of the west coast and it is determined to provide benefits to all members2. It is a financial co-operative institution that is owned and controlled by its members. The Credit Union Society promotes thrift, provided credit at reasonable rates along with other financial services. Individuals born, residing or working, owning property in the west coast district of Anse-La-Raye and Canaries, and individuals who originated from the district that reside in another community or overseas who are over the age of sixteen (16) years.

West Coast Communities Co-operative Credit Union Society Ltd presently hold two branches for its member's convenience in the communities of Anse-La-Raye and Canaries. With the close of the proposed road connecting Venus -Millet to Anse La Raye, membership in Millet that were previously some 5 km from the credit union now have to travel some 15 km to Anse La Raye.

6.2.7 Land

In rural communities of Saint Lucia, there is a very strong cultural and social value attached to private land ownership, as an expression of identity, autonomy and personal achievement. One group that has been leading in the push for going back to the land and food sovereignty has been the Rastafarian community across the island. In the Anse La Raye, Rastafarians have a special relationship with natural resources and a special interest in businesses based on sustainable uses.

Overall, the rural economy and its overlap with agricultural development has afforded opportunities for more entrepreneurial approaches that can be taken. In the case of farming, and its intersection with tourism through fresh fruit vending opportunities become available to the many small-scale agricultural

[2] https://www.facebook.com/pg/WestCoastCommunitiesCoperativeCreditUnion/about/

entrepreneurs who operate their businesses, and are able to access an expanded market for their fresh products.

6.2.8 HIV

Saint Lucia's HIV prevalence rate is estimated at 0.55%. This puts it at the low end of the scale among Caribbean nations. This means that five out of every 1,000 persons in Saint Lucia is reported to be infected with HIV[3].

The most vulnerable group for HIV infection is the age group 25-34 years of age. This group accounted for a total of 32.5% of all infections, with men accounting for 31% and women 34% of the infected.

The most vulnerable group for AIDS disease is males between the ages of 35 and 44 years. Females in the age group 25-34 years are the most dominant group in terms of both HIV (29%) and AIDS (34%).

Contextual factors are often associated with areas where HIV incidence is high. These include:

- poverty and unemployment
- lack of health care services
- alcohol consumption
- high population mobility
- urbanization and rapid growth
- high male-to-female ratio

6.2.9 Poverty

According to the St. Lucia Country Poverty Assessment (2005-6), the poverty gap was highest in the Anse la Raye/ Canaries district. Multi-dimensional poverty was highest in Dennery followed by Anse la

[3] PLACE in : Identifying Gaps in HIV Prevention in , St. Lucia Castries Gros Islet, and Anse la Raye, 2007, USAID

Raye/Canaries at 0.37 and 0.32 respectively. The 2005 poverty assessment of St. Lucia identified the Millet area with the highest levels of poverty4 in the district. Follow up data from the Census 2011 and previous studies confirm the result that Anse la Raye/Canaries is the poorest of all the districts in St Lucia.

The GOSL Statistical Review makes particular mention of the serious implications for long term consequences for indigent children in Anse-la-Raye. It also found there to be disproportionately high numbers of the non-indigent poor females to be living in Anse-la-Raye (9.3%). In the context of males aged 15 years and over who were deemed to be vulnerable, it found that the largest concentrations were observed in the disproportionately high concentration in Anse-la-Raye (11.3%). Residents in the majority of the communities were of the view that children were the ones most severely affected by poverty.

6.10 Strategy to Combat poverty

In the context of the proposed project the GOSL strategy to combat poverty include the following

- Develop other tourism services such as entertainment, festivals, French connection, community tourism, all inclusive, backward linkages to agriculture, fishing, and creative industries
- Renew efforts at agricultural diversification paying special attention to the needs of farmers, marketing, agro-processing, infrastructure, support mechanisms, including access to credit
- Develop other tourism services such as entertainment, festivals, French connection, community tourism, all inclusive, backward linkages to agriculture, fishing, and creative industries
- Promote Community Tourism by the development of enabling infrastructure which ensures that small indigenous hotels, guest houses, inns and products and services will continue to be increasingly involved in catering for an expanding clientele, not only from the USA, but also from Europe and other source markets

[4] *Caribbean Development Bank , St. Lucia Country Poverty Assessment (2005-6) Volume 1 Main Report, done by Kairi Consultants*

TABLE 4.6: DISTRIBUTION OF POPULATION BY DISTRICT ACCORDING TO SOCIO ECONOMIC STATUS

District	Socio-Economic Status				% of population/ sample
	Indigent	Poor But Not Indigent	Vulnerable	Non Poor	
	%	%	%	%	
Castries City	10.9	4.2	13.1	12.1	10.1
Castries Sub-Urban	11.3	24.7	32.1	34.4	31.0
Anse-la-Raye	20.4	9.1	10.1	3.3	6.2
Soufriere	1.5	8.7	4.0	4.7	5.7
Choiseul	-	4.6	2.0	3.1	3.3
Laborie	-	6.7	3.0	3.7	4.4
Vieux-Fort	25.6	5.7	8.1	9.6	8.6
Micoud	27.4	15.9	8.8	8.6	11.0
Dennery	-	9.1	7.6	6.5	7.3
Gros-Islet	2.9	11.1	11.2	14.1	12.6
Total %	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
Count	2,670	44,845	26,680	90,646	164,842

Figure 111 Population distribution by Socio economic status

Table 4.6: Poverty Gap Measure by Subnational Regions

	Poverty gap			Contribution to Overall Poverty			Distribution of Population		
	SLC-HBS 2006	SLC-HBS 2016	Change	SLC-HBS 2006	SLC-HBS 2016	Change	SLC-HBS2006	SLC-HBS2016	Change
District									
Castries City	3.4	10.3	6.9	3.8	22.6	18.8	10.1	16.5	6.5
Castries Sub-Urban	6.7	6.2	-0.5	23.0	20.1	-3.0	31.0	24.6	-6.4
Anse la Raye/Canaries*	17.7	12.5	-5.3	12.3	8.3	-4.0	6.2	5.0	-1.2
Soufriere*	12.4	8.0	-4.3	7.8	5.6	-2.2	5.7	5.2	-0.5
Choiseul*	9.7	4.5	-5.2	3.5	1.9	-1.7	3.3	3.2	-0.1
Laborie*	10.6	5.4	-5.1	5.1	2.9	-2.3	4.4	4.0	-0.4
Vieux Fort	10.2	8.1	-2.2	9.8	9.5	-0.3	8.6	8.8	0.3
Micoud	14.1	11.9	-2.2	17.2	16.0	-1.2	11.0	10.1	-0.9
Dennery	11.4	10.6	-0.9	9.3	9.4	0.2	7.3	6.7	-0.6
Gros-Islet	5.9	1.8	-4.0	8.2	3.8	-4.4	12.6	15.9	3.3
Total	9.0	7.5	-1.5	100.0	100.0	0.0	100.0	100.0	0.0

Figure 122 Poverty Gap

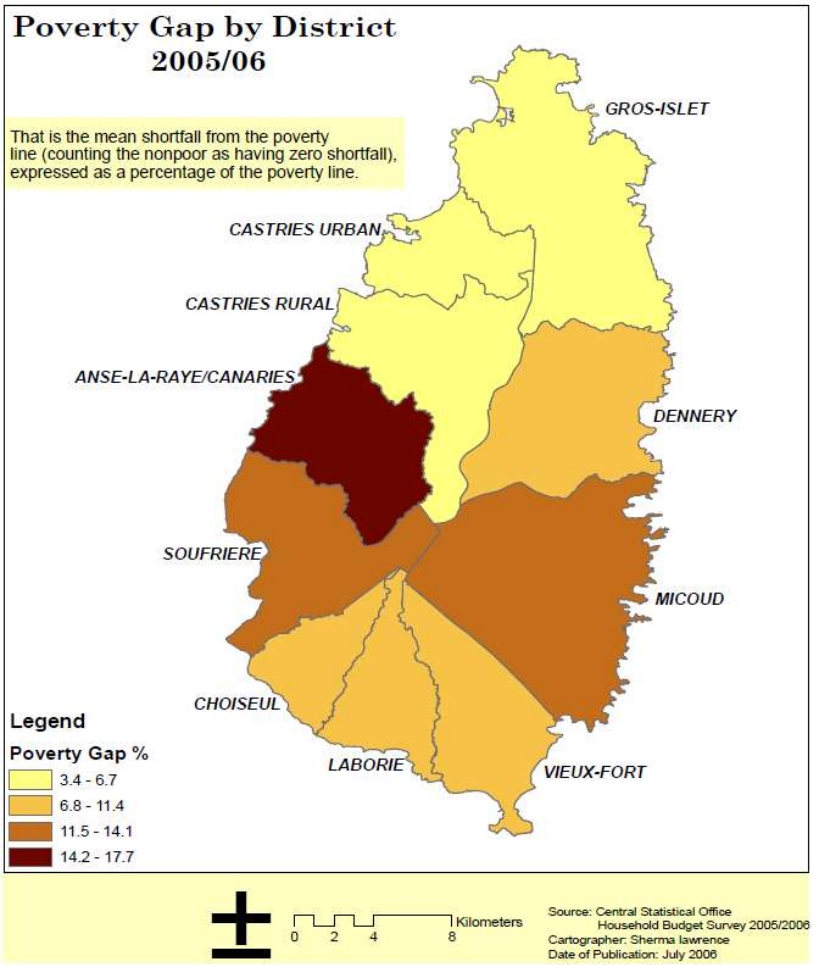

Table 15: Poverty Headcount Rate

	SLC/HBS 2006	SLC/HBS 2016	Change	Number of households in Sample
District				
Castries City	13.1	27.6	14.5	171
standard error	*3.59*	*5.15*	*6.28*	
Castries Sub-Urban	22.2	19.0	-3.2	311
standard error	*3.15*	*2.96*	*4.32*	

Anse-La-Raye/Canaries	44.9	38.0	-6.9	111
standard error	*9.09*	*8.20*	*12.25*	
Soufriere	42.5	25.5	-16.9	111
standard error	*16.18*	*8.66*	*18.35*	
Choiseul	38.4	16.9	-21.6	84
standard error	*7.17*	*4.55*	*8.49*	
Laborie	42.1	23.4	-18.7	93
standard error	*10.08*	*5.68*	*11.57*	
VieuxFort	23.1	34.6	11.5	148
standard error	*7.05*	*5.91*	*9.20*	
Micoud	43.6	31.2	-12.4	155
standard error	*7.57*	*6.64*	*10.07*	
Dennery	**34.2**	**45.0**	**10.9**	**122**
standard error	*5.82*	*6.15*	*8.47*	
Gros-Islet	24.4	11.8	-12.6	186
standard error	*4.74*	*3.80*	*6.07*	
Total	28.8	25.0	-3.8	1,496
standard error	*2.03*	*1.74*	*2.68*	

TABLE 4.12: PERCENTAGE DISTRIBUTION OF MALES AGED 15 YEARS AND OVER BY DISTRICT ACCORDING TO SOCIO ECONOMIC STATUS

District	Socio-Economic Status				Total
	Indigent	Poor But Not Indigent	Vulnerable	Non Poor	
	%	%	%	%	%
Castries City	10.5	4.0	9.6	11.9	9.5
Castries Sub-Urban	16.2	26.8	32.6	32.7	30.9
Anse-la-Raye	15.6	6.9	11.3	3.8	5.9
Soufriere	-	7.5	4.0	4.8	5.3
Choiseul	-	3.4	2.1	3.4	3.2
Laborie	-	5.8	3.2	4.1	4.4
Vieux-Fort	40.3	6.2	8.7	9.5	8.9
Micoud	17.5	17.8	9.7	8.2	11.0
Dennery	-	9.2	5.3	6.0	6.6
Gros-Islet	-	12.4	13.5	15.5	14.2
Total	698 (100.0)	13679 (100.0)	8335 (100.0)	31189 (100.0)	53901 (100.0)

Figure 53 **Vulnerable males in population distribution**

6.2.11 Forestry Opportunities

With a large portion of Saint Lucia's central interior consisting of rainforest, and over thirteen percent of the island as dedicated Forest Reserves, Saint Lucia has committed itself to protecting its abundance of tropical rainforest. While protecting this land entails shielding the rainforest from the stresses of development, many opportunities still exist to capitalise on Saint Lucia's bountiful forestry through low impact ecotourism. By creating and developing tourist ventures that have minimal impact on their surroundings, Saint Lucia can enjoy the profitability of these opportunities, while still maintaining the vigilant balance necessary to preserve the integrity of the environment, which characterizes much of its appeal to eco-travelers.

6.2.12 Agriculture

According to the Agriculture Digest, Growth in the Agriculture Sector was negative in 2017, having contracted by 6.2 percent, as compared to the year 2016 where the sector grew by 2.9 percent. Growth within most subsectors contracted, except that of bananas which exhibited a 6 percent increase, and that of Forestry, which exhibited growth of 0.8 percent.

The Vanard Vênus Anse La Raye Road is located in region Seven Agricultural Extension District. The boundary extends to about four miles of Feeder Road. The area has approximately two hundred farm families, whose livelihood is made primarily from farming.

Prior to the passage of hurricane Tomas farmers planted mainly food and root crops, tree crops, and vegetables.

The main crops grown are bananas with an average production yield of about twelve tons per acre, followed by dasheen, vegetables and pineapples. The famers identified in the area have shown increase resilience following the passage of Hurricane Tomas in 2010 which completely destroyed their road network.

This has seriously impacted the Agriculture sector mainly in the production of Bananas which was more or less a major steady income earner providing weekly and fortnightly income for over sixty farmers. The production of vegetables has been very high attracting a large percentage of female farmers who produce the crop.

There are a number of farmer groups within the area namely

- The Venus /Millet Rural Women's Network as well as
- The Flower Producers Association.
- A very active Mothers and Fathers group which was very popular as a driving force in keeping the Coude de main concept alive was displaced.
- An agouti Ranching Project launched in the late 2000's was also displaced.

Some facilities still remain such as an input depot and a large green house project located in the area which can provide employment for many farm families.

Other services have been abandoned including an eco-tourism project, a quarry and water purification project which had to be placed on hold due to absence of road works.

The damage to the road infrastructure by Hurricane Tomas seriously impacted crop and livestock production in the area.

A large number of abandoned farms exist at present and families have been displaced as a result of non-accessible farms.

The few farmers working in the area have recorded significant decreasing yields in production as fertilizer and other inputs are not available on a timely basis.

There are other factors that continue to impact the farmers in the area these include:

- Poor quality fruit
- Reduce number of farmers going to the central market
- Higher Transportation cost for inputs etc.
- Reduced yields per acre

6.3 Social Surveys

Social surveys were carried out within the community to obtain relevant information on their status of the community, their perception of the project and its impacts on them and their livelihoods, , and recommendations on how they believed the project should progress that would benefit the community. This complemented the consultations held with the community. The structured questionnaire used is reflected in Appendix 6, the results of the survey are reflected in Appendix 7, and Appendix 8 highlights the details of the various consultations for refence.

6.3.1 Methodology

The section on baseline presented in this report has been compiled using an integration of data from secondary sources (cited in the section of references), focus group discussions with residents,

interactions with other key stakeholders, observational studies, and a household survey undertaken by the ESIA team in January 2020

As part of the ESIA, a survey was conducted to better understand how the proposed rehabilitation of the Vanard/Venus/ Anse La Raye access road project would affect residents in the community. The surveys sought to collect information on the perceptions of residents on the project, and communities on the potential social impact of the proposed road rehabilitation. The surveys were conducted using a systematic form of sampling for which every other household was selected. The sample size for both surveys consisted of a total of 85 respondents. 39 respondents were questioned on their views of how the proposed project would affect communities and 46 for their viewpoints on the social impact component of the survey.

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6.3.2 Results from Questionnaire of Project Affected Persons

Appendix 7 is refenced her for information. 87.2% of respondents were from the Venus (48.7%) and Vanard (38.5%) area. The majority of respondents were between 41 to 60 years of age (51.2%). Livelihoods of respondents tended primarily towards farming, with others involved in economic activities such as shop owners, construction workers. A small percentage reported that they were retirees. The average household size for respondents was three persons, and this was also the modal household size. 64.2% of respondents had lived in the community for over 50 years. 12.8% of those attested to living in the community for their entire lives.

The majority of respondents who owned lands either purchased those plots or inherited their parcel of land (69.2%). Many persons were unsure of the size of their land or did not want to provide the information. The few persons who did provide this information to interviewers indicated that thwir size plots ranged from 0.14 to 39 acres of land.

The main source of income for respondents include farming (17.9%), employment (30.8%) (the nature of which was unspecified), family or spousal support (15.4%) and sale of produce/ market vendor (10.3%). The majority of household members possessed primary level education (70%) and secondary level

education (48%). 43.6% and 36% and of respondents lived 4 km or less from the infant school, and primary school respectively. 20.5% of respondents lived over 6 km away from a college.

As it relates to public health, most respondents reported to have suffered from cold/flu/zika both monthly (33.3%) and seasonally (12.9%); as well as eye infections on a monthly basis (7.7%). As it relates to health assistance most respondents sought out care at clinics specifically the Vanard Health Center (74.6 %) and at Victoria Hospital (15.4%). 7.7% of respondents utilized private medical facilities (private doctor). Most respondents lived at most 2 km from the health facility used for health assistance.

Some of the main concerns shared by respondents as it relates to rehabilitation of the road on community health was potential issues related to dust, noise and water. They listed breathing problems related to dust in the air, disruptions to water as a result of pipes being damaged, excessive noise and landslides along the roadways. The most common and critical issues identified by 51.3% of respondents were related to water issues and breathing and respiratory issues.

Most respondents lived in either permanent (87.2%) or semi-permanent (7.7%) housing. Some of the main concerns of respondents as it related to housing include landslides (from roads being dug, grading of the road, digging, damage to access road, living on hill), roads and housing need to be fixed and possible damage to retaining walls.

Most respondents involved in agriculture were involved in the production of dasheen (33.3%), plantains (25.6%), yams (17.9%), vegetables (23.1%) and potatoes (17.9%). Some of the concerns expressed by residents as it relates to agricultural production include the loss of land or the damage of farm lands/ farm resulting in the loss of livelihoods, and the need for roads and retaining walls to be fixed.

With respect to land tenure most of the land was freehold (registered) (48.7%) or leasehold (10.3%). Most respondent believe that the road rehabilitation will result in higher or increased prices to land which will have the spin-off effect of causing lands in the area to be more expensive. One respondent expressed concern for persons getting dislocated from their lands without receiving payment.

As it relates to livestock production very few respondents were involved in this activity. Those who were involved reported that they reared sheep, goats and pigs. Generally, respondents had no concerns about the rehabilitation of livestock production however those who did express concerns mentioned the removal of farms/ livestock close to roads and the reduction in livestock production.

The main items for which respondents would require compensation included land (12.8%), home (17.9%) protective/ retaining wall (7.7%) and crops close to road (5.1%). The preferred modes of compensations include cash value (61.5) and land for land (7.7%). Few respondents sought resettlement however if this was required, the preferred area for resettlement noted by respondents was the Vanard area.

Respondents believed that the proposed road upgrade would result in better roads for farming and commuting for residents (45.7%), community togetherness (10.9%), pride (4.3%), greater employment (13.0%), and reduced dependence on government (4.3%). All respondents believed that it was a good idea to upgrade the road mainly because the community and its residents need good road infrastructure for the ease of commuting and access if needed for emergency vehicles (fire, ambulance). Respondents stated that good roads will make schools and health facilities more easily accessible. Some other important reasons given by respondents included: enhanced farming activities, greater employment opportunities, business opportunities and tourism.

Respondents generally believe that the proposed upgrade will result in employment (37%), community togetherness/ pride (15%), increased business activity (13%) and proper housing and roads (13%). 87% of respondents attest to being affected by the existing road through increase bus fare/ potential strikes (34.8%), damage to vehicles (17.4%), bus driver unwillingness to transport passengers to areas where the road is bad (8.7%), longer travels using alternative route (4.3%).

Lastly respondents would like to see the road upgraded through proper, smooth paved roads, sidewalks, proper drainage, retaining walls and proper safety barriers.

6.4 Community Consultations

Consultations were held with the community and key stakeholders to inform them of the project, its design and its proposed works, and to obtain feedback in respect to their perception of the project and its impacts on them and their livelihoods, and in particular with the key stakeholders, solicit critical recommendations on its various components. The community was particularly interested in its impacts

on their safety and livelihoods and issues and recommendations were solicited within that scope. Reference is made here to Appendix 8 for details of the consultations.

6.4.1 Stakeholder Composition

Views from national stakeholders, local authorities and the likely affected communities were sought through meetings. The World Bank's Operational Policy 4.01 also emphasizes consultation and public disclosure of a project. The broad objective of the stakeholder engagement process was to provide the authorities, interested parties and the communities likely to be affected by the project an opportunity to state their views, concerns, and opportunities with regards the proposed project and to consequently address their concerns.

Stakeholder identification was based on issues related to the project scope of works, relevance and influence of the stakeholders and administrative and traditional setting of the project among others.

6.4.2 Community Meetings

Two community meetings were conducted between January to February 2020. Community members were invited from radio announcements, social media posts and personal invitations from various community groups. At the meetings, a trained facilitator led discussions and names and contact information for all attendees were collected. Those present represented a cross section of the community including farmers. During meetings, a scripted guide was followed which was adapted to suit the respective organizations interest. These details are further discussed later in this report.

The first community meeting was held Saturday, 25th, January, 2020 at the Anse Le Raye community hall at 6:30 pm in the community for purposes of a consultation for the preparation of completed designs for the Anse Le Raye, Varnard road – ESIA. The PM of the DVRP was in attendance.

The second meeting was held on Wednesday, 5th, February, 2020 at Anse Le Raye community hall at 7:30 pm in the community for purposes of a consultation re the preparation of completed designs for the Anse Le Raye, Varnard road – ESIA. This again included various persons from the community, including farmers but may persons refused to provide their names and occupation or designation.

Figure 54 First meeting with the community of Anse La Raye at parish hall

6.4.2.1 Community_Potential Affected Population

While the larger population of the Anse La Raye region is estimated as 6,247 persons, the more directly affected persons by the rod project, excluding Anse la Raye Village, may represent a population of approximately 1,003 persons stemming from the communities of Durandeau (315), Venus (98), Millet at Tet Chemin (362), and Millet at Caico (228). These are the communities closest to the existing road and more given to traversing it. This number would include farmers who ply the farmlands along the road and would benefit from its rehabilitation.

The exact number of single female headed households, youth at risk, young girls, LGBT, Disabled, senior adults etc could not be properly determined as the information was not readily available.

Saint Lucia does not presently have a national policy or plan to address **gender**-based violence or **gender** equality. Of note is the fact that Article 131 of the Saint Lucia Labour Code, enacted in 2006, bans "unfair dismissal" based on sexual orientation. The *Equality of Opportunity and Treatment in Employment and Occupation Act* 2000 attempts to ensure equal employment opportunity for all. Employment of members of the community must not be of any biased nature and the contractor must ensure that all applicants are reviewed equally and fairly for the position applied for and their skill level or qualifications. While there is no distinct legislation that speaks to violence against women or those of different sexual orientations in the work place, the Saint Lucia Criminal Code (revised 2005) is gender neutral and speaks to acts of violence against everyone.

According to the *Saint Lucia's Report To The 11th Session Of The Regional Conference On Women In Latin America And The Caribbean* in June 2010 the last Poverty Assessment (2005/6) carried out in St. Lucia indicated that 28.8% of the population was classified as poor, and 1.6% was considered indigent. Four (4) of St. Lucia's six (6) districts were described as the "most indigent communities". The rate of unemployment for women at the end of 2007 was 18.6%. The general rate of unemployment peaked at 20% in the year under consideration. Just over 50% of unemployed women fall between the ages of 15 – 34. Most of these women only have a primary school education and few marketable skills which seriously hampers any 2 attempts to enjoy a reasonable standard of living and ultimately deprives them of enjoying their basic human rights.

It is expected that all members of the community (including single female headed households, youth at risk, young girls, LGBT, Disabled, senior adults etc) will be directly of indirectly affected by the road project. Opportunity will be available for both direct employment (which should be in a non discriminatory manner) for all persons, as well as opportunities in service to the development during its duration. Such service would include the provision of food to the workers via roadside canteens by industrious individuals (usually women, single or otherwise, and their daughters). This would provide for a medium term source of income. Youth may also be involved in the temporary employment opportunities available on site as construction is a major employer and such construction can provide to the multiplier effect within the affected communities. The provision of an upgraded road also mean the better opportunity to be able to transport the ailing elderly in a more comfortable manner to medical facilities in the north of south of the communities.

It has been previously mentioned in the report that the road also provides for tourism related opportunities especially in relation to view points and viewing various biodiversity. Women and youth within the community can form local tour groups, and with the assistance of the Forestry Department and the Government initiated Heritage Tourism programmes can set up road side and tour related facilities working along with the Ministry of Tourism as well.

6.4.3 Main Issues Raised and Responses

The following table summarizes the main issues that were raised by the attendants of both meetings and the consultants' responses. It was important that all of the community's concerns were addressed so that there was transparency and that the community was ensured the opportunity to contribute to the planning, design, and eventual implementation of this project that will affect them.

Table15. Main Community Issues and Responses

	Issue / concerns Raised	Response / Actions to address issues/ concerns
1	How soon will the project start	Not before August 2020. Implementation will be guided by the process of the World Bank.
2	has funding been identified for the project,	Yes. The DVRP Project Manager response; financing was provided for under the DVRP World Bank project.
3	Up to five (5) people are reported to have died from the Fer de Lance snake bites over the past 10 years. The road provides relief in the event that persons get bitten by a poisonous snake and need medical attention and is now impassible	The road connectivity will be restored
4	This road is the only bypass available in the event that damage occurs on the West coast road of St. Lucia	The road can serve as a temporary bypass in the event that the West Coast road is damaged. However it is not of the classification to sustain the vehicle throughput of the West Coast Road
5	The tour operators using that road, brought tourists into the	The connectivity will restore the ability of the tour business

	village and the livelihoods have been lost	
6	Sections of the road is very narrow in some areas and is cause for concern given the steep drops that exist along the road	There appears to be adequate road reserve width. Sections are narrow because of the overgrowth in the roadside verges have been allowed to the years without scheduled maintenance.
7	There is a concreted area which is very slippery and dangerous.	This section of the road surface will be improved by surface treatment and resurfacing
8	In particular areas there is a lot of forest cover and needed to be cut back to allow for sunshine to reduce the slipperiness of the road and to keep the road dry	The removal of canopy falls under the maintenance department of DIPE. The DIPE have options for routine cleaning of the road surface to remove organic material or the removal of the overhead branches to introduce sunlight,
9	There is precipice in certain areas and protection barriers are needed to be built	The provision for barriers will be included in the construction bills to be installed where required.
10	Drainage is needed in certain areas	Drainage will be provided for in the designs
11	Landslides occur when it rains, slope stability is therefore of concern. What about terracing these areas	There is loose material that is not held in place by vegetation in areas along the roadway. Where possible, the loose material will be removed and bioengineering used to stop the occurrence during rainfall.
12	Vendors purchase farm items from Castries and resell them at exorbitant prices in the community so there is need to open the road so farmers can continue to farm on their lands. Loss of income due to this	Connectivity will restore the access to lands
13	The flora and fauna should be protected during construction	The project will be mostly confined to the existing road reserve except where support walls are requires for the road. Environmental degradation can be managed in such a project.
14	There was previously lack of maintenance done on the	This is the responsibility of the DIPE

	road and residents expressed concern that the same could reoccur	
15	The road provides quick transportation from one community to the other but this was lost	This connectivity will be restored
16	The road would be a blessing for the community if restored	ditto
17	Women were mostly concerned about the children's safety whilst walking along the roadside at present. During upgrade there is a request for walking lanes sidewalks.	This concern pertains to the road nearby the Anse La Raye community and school. There is no residential use along the unpaved section of road leading to the quarries. The road surface is paved, however the surface is covered by loose material that gets dropped from the trucks transporting material from the nearby quarries. The material is lifted and spread as the trucks accelerate over the paved section of the road.
18	Women were concerned about the; level of dust that is raised by the road surface. After upgrade it is likely that more vehicles and more dust would be generated.	The pumice gets out of the trucks because water can carry the fines from the truck boxes during transportation. There is need for maintenance for the removal of pumice fines from the road surface. A function that the DIPE has to address.
19	There was concern that the runoff would flow into the catchment and therefore contaminated.	Runoff from the construction works will be managed to reduce instances of contamination of the catchment.
20	Need for a layby for people to do bird watching to reduce the instances of parking in the roadway	The cleared reserve will provide adequate parking for a limited time while taking in the views. This is not encouraged, given the potential conflict with wildlife in this area.
21	There was concern of the heavy trucks destroying the road surface and request that the road be designed to withstand the heavy loads.	The road and surface will be designed to DIPE approved standards

22	Concern that the byproducts of the pumice washing flows into the river and cause degradation to the riverine and marine environment	This is out of the scope
23	Whether the road should be placed in the same landslide prone area or remove the road entirely to an alternative location	The road alignment will remain.
	The meeting was concerned about the occurrence of accidents given that the area is a high rainfall area, it was recommended that the project mitigate against accidents using barriers, retaining walls, drainage, landslides and road widening.	The consultants confirmed that this would be done. They appreciated the potential hazards.
	Dust on the Anse la Raye end in proximity to the school.	Trucks will be covered and precautions taken as best as possible. However please note that there are also existing heavy trucks from the pumice quaries.
	Up to five (5) people are reported to have died from the Fer de Lance snake bites over the past 10 years	Workers will be cautioned and the necessary protective measures will have to be taken during the project. This will be included in Health and Safety procdures.
	Concern that Roads are constructed without Maintenance and clearing of drains and landslides.	This is matter for the DIPE
	There was a question as whether the roads in Anse La Raye will be included in the works.	This is a matter for the DIPE as the project only involves the road up to Venus and not through the village.

6.4.4 Perceived Project Benefits

The perceived **Benefits** of the road that was obtained from the meeting were highlighted as follows:

- Quick transportation from one community to the other.
- The road would be a blessing for the community if restored
- The reestablishment of access to abandoned farmlands and lost crop revenues for farmers who have their homes in the Anse La Raye village and their farms in the Venus /Millet area (one of the farmers lost over 5000 pineapple crops after having to abandon his farm and will likely return if the road is improved)
- Reversal of what is now a total loss of livelihood for the village
- Cut down travelling time between communities
- Vendors will be able to vend again to earn a living.
- More trips to the rainforest by tourists and locals.
- The road is needed urgently.
- Shorter distance to Vieux Fort to conduct business
- It's an alternative route in the event of blockage on the west coast road.
- If anyone gets bitten by the poisonous snakes or needed medical attention this will be a quicker alternative.
- Access for emergency vehicles and alternate routes in the vent of disasters
- There has been no real reported abuse of wildlife by the community over the years of the road in operation.
- Anticipate that village tourism would be increased with the advent of the road opening. Vendors want to be preemptive and proactive to be prepared in advance of the tourist arrivals by preparing for the types of payments card and cash. Therefore a uniform payment system for vendors should be explored.

- The fish fry will regain many patrons from the local Millet community with the un blocking of the road

6.4.5 Consultations with Key Informants

The following highlights the consultation with National level stakeholders. Reference is made to Appendix 8 here for details. There was continuous engagement with government institutions and national level stakeholders to inform the ESIA. The summary of discussions held with government stakeholders to date is presented in the following section.

The extracts depict that meetings were quite informative and that stakeholders generally expressed the willingness to work collaboratively and promote their interests (mandate) alongside the DIPE. Measures of performance (monitoring indicators) specifically for social and measures to mitigate potential negative impacts were suggested by most departments in line with their interests. During interviews, a scripted guide was followed which was adapted to suit the mandate of the organizations. Details are further discussed later in this section of the report

6.4.5.1 Teachers/ Educators

From the perspective of the school and educators, the road rehabilitation work is long overdue and they are concerned on the impact of the existing road on student's welfare and safety. Teachers expressed their concern at being also affected by the road condition and complained about drivers dropping into potholes and splashing them with dirty road water as they walked along the side of the road. Further, parents and visitors to the school complain that it is a problem to visit the school because of the road conditions and the difficulty in getting a ride. Also, some noted that it was dangerous for children to walk to school. There was mention about ongoing conflict in the area of the Caico Junction near the bus stop. Once the road was rehabilitated, it was stated that the school will become more attractive for persons in

the community to attend, particularly since the common entrance performance is better than the surrounding schools.

6.4.5.2 Credit and Finance

The West Coast Communities Co-operative Credit Union Society Ltd provides credit and loans to the community of Anse La Raye and the West coast of the island. The Credit Union normally offers better terms to the members than the banks. Close proximity to the credit union will have a positive impact on the lives of the community. The Credit Union has seen a reduction in economic activity previously recorded from the Venus Millet area. The project resources can positively impact the community if work opportunities are given to the community workers. From their perspective, more persons in the community are self-employed and engaged in agricultural, fishing and tourism related activities. Therefore all effort should be afforded to the community to improve through the restoration of the Vanard Venus Anse La Raye road.

The road improvement will allow for quicker turnaround of financial transactions, and the additional membership will help the Credit Union to grow to better serve the communities. Better access to withdraw and deposit money. There would be better monitoring of the money loaned as the lenders can now visit the community to observe the asset and there is a better chance to approve the loan application. General improvements in the ease of doing business; for the rural community people and betterment of their livelihoods.

6.4.5.3 WASCO/water supply

WASCO has interest because of the existing pipeline and the Dam users, given that this is the main access road to the Dam serving the north of the island. There was potential for conflict if diversion of the pipeline should occur and or possible damage to pipelines and instances where access to the pipelines lines may be cut off. If there is a disruption to the service by damage to the pipeline, the entire country north that serviced by the pipeline could be impacted, this should be avoided.

The impacts of this occurrence could be mitigated if WASCO was provided with drawings and the project make allowances for a crew to be available to the project in the event that there is damage to the pipeline. This crew can serve dual purposes, to identify and to repair the pipelines. Wasco approved of the project

given that the road is the only access to the John Compton dam and the bad roads put a strain of the resources of the water company.

6.4.5.4 Department of Environmental Health

Measures to control dust and particulate matter was seen as a serious concern from past instance. Dust generated under dry conditions effects persons with underling respiratory conditions. In addition vibrations from the use of heavy rollers etc. can cause mental fatigue from the jolts felt in people's homes. The possible damage to homes has previously caused the homeowners to seek recourse. General concerns included

- Signage issues generally arise as inadequate.
- Health concerned about the persons on the job using hand kerchiefs, flip flops no reflective vests, PPE's etc.
- Issues of staff welfare facilities, toilets water etc.
- Gender toilets
- Monitoring is usually left unattended, usually just engineering matters seem to be that concern
- From a health and safety perspective

The issue of redress when complaints are made should be addressed in the project. Past experience has shown a history of challenges in obtaining responses to issues raised from the public complaints. In spite of the public health Act which allows the complaint to be received, no proper line of response normally existed and this can cause run around for the Agency staff when complaints are made.
Most of the issues could be resolved if some sort of national system set up to monitor projects in general and the project assigns someone to address the public complaints on the project in an efficient manner. This is usually important to the residents.

The project is seen to have a beneficial impact to the Health sector for the following reasons

- Emergency vehicle will have better access
- Essential services can be provided
- Sanitation can be provided
- Reduction in vector borne disease such as mosquitoes, flies and rats

6.4.5.5 Island Adventure Tours

The Island Adventure tour group moves roughly 12,000 visitors through the community mainly during tour times 9.30 am to 2.00 pm. They run an attractive half day tour aimed at the hotels that allow the guests to return by 2.00pm. This tour will give an adventure through the rainforest of Vanard Venus Anse La Raye with only brief stops given the prevalence of snakes in the foliage. The Section through Venus was one of the preferred tours and well appreciated by the visitors. The tour is seen as more beneficial to Anse La Raye village than the Millet community, mainly because the vendors and structure is better prepared in the village. The tour owner comes from the village of Anse :a Raye and had a policy to stop and patronize all the community vendors along the main road of Vanard Venus Anse La Raye. There is future growth for the local economy through this link road for taxis and other tour operators.

This was seen as a major loss of revenue because the tours have stopped on this route. The route is unsafe and although the tour uses off road vehicles, passage is too dangerous for the guests and the vehicle structure. Patrons using this tour route were generally more contented and the vendors at the stop in Anse La Raye obtained more sales as a result the operator keenly awaits the route to reopen and expects that the community will record tourism growth and economic opportunity.

6.4.5.6 Anse La Raye 1987 All Stars

The Anse LA Raye All Stars is a sports group of the village youth with interest in the project. The group were upbeat about the community spirit and its excellence in the field of sports. It was their view that the damaged road made life difficult for residents to access their farms and this has caused people to stay away from the village. They expressed desire for the road improvement to commence as soon as reasonably possible with job opportunities given to the residents and good quality work. Neglect of children and increased minor crime was seen as the challenges that the community is currently faced with.

6.5 Assessment of Social and Economic Impacts

The residential communities of Vanard, Venus Millet and Durandeau and Anse La Raye are expected to be impacted. During the week of 20th January 2020, a social Impact Survey was conducted via a targeted sampling of community residents totaling 100 persons. The questions outlined in Appendix 6 and 8 were asked of these persons. The determinations of the potential social and economic impacts are highlighted below.

6.5.1 Impact on local Employment

During the exercise and in consultation with a number of construction professionals with experience in similar projects the following were determined. It is estimated that during the construction phase some 58 persons will be employed in site clearance, road and building construction. At an average of three persons per household the proposed project is expected to support approximately 174 persons monthly during the construction phase for a period of about 12 months.

Table 47 Employment (Construction Phase)

Staff	Quantity
Plant operation and equipment	10
Management	1
Supervisors	2
Casual Laborers	20
Technical Staff	6
Office Staff	3
Total	**42**
Trucking and Haulage Movement	Quantity

Drivers	10
Cleaners	2
Security Personnel	2
Delivery Personnel	2
Total	**16**

6.5.2 Impact on Economy.

As identified previously, the target communities are amongst the most economically deprived in the country. Road improvement has tremendous potential to act as a catalyst to economic development similar to what transpired subsequent to the improvement of the West coast Road.

The area has unique ecological attractions and the development of eco-tourism business initiatives is almost certain after the upgrade. This will also result in the spinoff of microbusiness enterprises catering to visitors (restaurants, handicraft, tour guides). During the community consultations, persons did indicate their willingness to get involved in these ventures. Improvement to the local road will likely have a direct impact on land values and marketability.

Since there will be steady flow of income in the community, financial institutions are inclined to lend for both commercial and residential ventures. West Coast Communities Co-operative Credit Union Society Ltd is one such financial institution with a physical presence in Anse La Raye that would like to increase their membership in the community.

6.5.3 Impact on Increased Traffic Volumes Through The Communities Of Durandeau, Vanard And Venus and Anse La Raye.

The improved road is expected to increase the traffic volumes along the main road of the predominantly ribbon or roadside rural settlements.

In general, roads play a crucial role in promoting economic, social and cultural development for communities. Improvement in road connectivity not only assures the development but also accelerates the process of development of the surrounding area and economy. The road connectivity through the rural area of Millet and Anse La Raye provides market access opportunities to the rural people by which they can develop market linkage with other stakeholders in the economy such as tourism.

In the rural setting, the development of the road is anticipated by the community to affect agriculture directly by restoring areas that was previously under agricultural production and enlarging the areas under cultivation. The road development also prompts a change in the type of agricultural production by diversification of cultivation of low cost crops to commercial crops. It encourages the production of protective foods of perishable nature, such as eggs, fruits, vegetables products.

The proposed intervention planned will break up the isolation of Anse La Raye villages from Millet and assist in spreading education and create a general sense of social awakening, promotion of health and various other social services.

The planned project is therefore a policy measure to stimulate economic growth and employment creation.

6.5.4 Impact on the population density

Roads with better accessibility enhance traffic density but when population density decreases, the road density as well as traffic density will decrease

6.5.5 Impact on the agricultural sector of the target communities

In rural areas the development of roads affects agriculture directly by enlarging the areas under cultivation. It was pointed out that many farmers abandoned their lands due to lack of access. With the upgraded road, it is expected that many of these farmers will return to cultivate the lands. Linkages will develop between agriculture and tourism in a direct way, since farmers can now sell fruits directly to visitors along the road.

The improved road project would likely attract farmers to return about 400 acres into production and directly benefitting over fifty farmers. and therefore injecting back life and provide livelihoods to over two hundred farm families and continued support by extension officers with new programs and new technologies; namely the import reduction program just introduced by the Ministry of Agriculture.

The farmers have the requisite skills and experience and history for efficient production practices.

There is demand from the nearby hotel Ti Kaye for agricultural produce. However, framers must be able to supply quality produce in a consistent manner. The impassable road conditions prevented that, so it can be expected that the road rehabilitation will lead to an improvement in consistency and quality.

The improved road will enhance transport facilitates and the free flow of the production to consumer centers and speed up the rural development of the district.

6.5.5 Impact on Education

Education is what supports the development of human capital with measured contribution to economic as and social development. It is expected that there will be direct positive effects on education as follows

a) Reducing travel time to school

b) Enhancing student enrolment

c) Reducing transport cost

d) More parent involvement in the student life

e) More interest in the school activities by the community

6.5.6 Impact on Markets

Roads in the rural area may allow the farmers to enable them to carry their production or output to the market centers.

6.5.7 Impact on Health

Transport plays a crucial role in access to health services. Transport is essential for accessing hospitals; health centers. Distribution of drugs and other supplies necessary for care and proper operation of health facilities. Reduction in the long term dust and road related illness particularly for persons with underlying respiratory illnesses.

Enabling the timely transfer of patients between health facilities and the different levels of care of health and referral system.

Facilitating access by doctors and other health workers to health and health caring centers.

Helping or promoting necessary monitoring and supervision of health services. Improvement in the wellbeing of the community.

6.5.8 Impact on family

During the construction, a number of women will be employed thereby reducing their dependence on men. This will contribute to the socio-economic imbalance between men and women bringing more stability to families especially single parent families led by women. Post construction many of the new investment opportunities which will arise from eco-tourism and hospitality related services will be filled predominantly by women. It has been shown that when women are empowered economically and financially, there is a decline in social ills and improvements in educational performance of children.

6.9 Land Acquisition

Within Section 3.5 of the report under land ownership, it was indicated that there would be the need for the acquisition of lands to facilitate the proper alignment of the road during the rehabilitation exercise. Properties that would be impacted with possible acquisition for the provision of retaining walls and other necessary structures would continue to be determined as the project commenced with the required surveys. The necessary adjustments and land take would be made to facilitate the functional alignment and protective works at various points. A list of the project affected properties are presented here below in table 18 for information and reference at this point in time.

The World Bank's approach to complex resettlement issues on any of their projects is that most can be adequately resolved if the particular issues or situations are identified early in the project preparation stages, and addressed early and expeditiously with the affected parties. The World Bank and then the local processes are highlighted below for guidance. The Banks's preference is not for compulsory acquisition.

Table 18. Vanard (Venus) – Anse la Raye Link Road-List of Affected Properties

	Registered Owner	**Block no.**	**Parcel no.**	**Notes**
1	Joseph Ramlal & Sylvia Ramlal	**0839B**	35	
2	Mary V Hippolyte		80	
4	Crown		48	
5	Anthony Philgence		56	
6	Lucia W St Omer & Esther A St.Omer-Ward		53	
7	Morris Isidore & Margaret Charles		94	
8	Castus JnBaptiste, Paulinus	**0838B**	3	

	JnBaptiste, Camellus JnBaptiste			
9	Lawrence Polius		4	
10	Jane Hippolyte		20	
11	Victor T Renee		146	
12	Victor T Renee		147	
13	Crown		24	
14	Crown		25	
15	Joseph Modeste & Lucille Modeste		39	
16	Joseph Modeste & Lucille Modeste		35	
17	Crown		97	
18	Crown		26	Road Realignment 70m in length. Land area 8,000 ft2.aquisition. 12no. dwellings on that parcel. Relocation not required.
19	Lelia Lionel & Arnold Mederick	**0637B**	6	Road Realignment 85m in length Land area 14,000ft2 acquisition – 9,900 possible easements. Farmers.
20	Celricka Dantzic		29	
21	Theressa Louisy, Jerome Maurice & Marie Joseph	**0638B**	32	

22	Matthew Phillip		25	
23	Christina Paul		34	

6.9.1 The World Bank Approach to the Land Acquisition

The World Bank, consistent with Policy, 4.12 Involuntary Resettlement, and the DVRP's Resettlement Policy Framework, tends to favour a more communicative and negotiative approach to the acquisition of any required land rather than compulsory acquisition which suggests a more heavy handed approach. The Bank provides standards and guidelines for acquisition and describes the requirements necessary to assist in facilitating the process.[5]

Negotiations with any affected landowners and farmer(s) identified by the project and confirmed by the PCU, may be facilitated through the PCU and its Social Safeguards's Section under the DVRP. Institutionally, the PCU resides under the Ministry of Economic Development, Housing, Urban Renewal, Transport, and Civil Aviation. The Chief Economist in this Ministry along with the PCU would take the lead role and with DIPE present. The PCU's Social Safeguards's section must ensure that the World Bank's Social Safeguards are incorporated and complied with in throughout all aspects of the project.

The property owners or famers affected by the project must be identified and compensated for any lands to be acquired for site works and access alignments. In the case of the farmer(s) whose crops has or will be damaged, the site must be identified and their crops properly assessed by the Ministry of Agriculture, for compensation. The identification of these project affected persons (PAP), the affected crop, its location, and conditions, must all be done **prior to the project commencing on ground**.

[5] The World Bank Standards and Guidance notes ESS5 for land acquisition may be sourced at the following link: https://www.worldbank.org/en/projects-operations/environmental-and-social-framework/brief/environmental-and-social-standards

It is important that a proper assessment of the damage to crops and land is made and that the correct land owners are not just the farmers are identified. The correct LRTP block and parcels must be identified so that the location of owner's lands and the farmer's plots can be correctly identified.

There must be an element of transparency within this whole process and any disclosure procedures that are implemented must be in keeping with Bank's Policy 4.12 and the PCU's DVRP Resettlement Policy Framework.

The process guided by the Resettlement Framework which the PCU through the Ministry of Economic Development would facilitate is as follow:

The landowners and farmers affected by the project would be identified by DIPE and consultants and confirmed by the PCU. The PCU and DIPE would engage the farmers and property owners (PAPs) to ensure that they clearly understood the project and the intention for which the particular portions of their property is being sought is going to be used for. The crops that would be affected would have to be assessed and valued. After discussions between DIPE and the PCU with the landowners, and, a request would be forwarded from the PCU to the Permanent Secretary of the Ministry of Economic Development to begin the process of acquisition.

The Permanent Secretary would then write to the Permanent Secretary of the Department of Physical Planning in the Ministry of Agriculture, indicating the rationale for the request and the intent to acquire. The Permanent Secretary of Physical Planning would prepare a memo to the Cabinet of Ministers through the Cabinet Secretary with all supporting documentation to have a Declaration of Intent to Acquire prepared. Once this has been approved by the Cabinet, the declaration is published in two notices of the Gazette. If there are no contentious objections, the Permanent Secretary of Physical Planning directs the Authorized Officer or Chief Surveyor to commence surveys of the properties and determine the cost of the lands to be acquired for compensation. The PCU with its Social Safeguards section would call a meeting with all affected land owners and farmers and would negotiate with them. This negotiation process would

be led by the Chief Economist or their representatives of the Economic Development Ministry with PCU and DIPE in attendance. This process is to be guided by the principle of fairness and respect for all parties.

Upon acceptance of the compensatory amount by the PAP, a formal contract would be prepared which included the agreed price and also the cost for any lost crops with the assessment from the Ministry of Agriculture. Under the DVRP after acceptance by the PAPs, a formal letter documenting that agreement along with a copy of the compensation agreement is sent to the Accounts Section of the Ministry of Economic Development with a requisition order. Compensation is based on Full Replacement Cost as per the Bank Policy and the DVRP's Resettlement Policy. Unlike the formal process under the Compensation Act which allows for the accumulation of interest on the compensation because of the length of time that can transpire before a PAP receives payment, the World Bank requires that settlement be done immediately upon the formalization of the agreement of compensation between the parties involved.

It must be noted that once information has been obtained on persons who might be affected by the project a **Resettlement Action Plan (RAP)** is prepared by the Social Safeguards Section of the PCU and continually updated as the process continues. The RAP will include the information on the PAPs (land owners and farmers), the full consultation and discussions with the PAPs, the publications in the Gazette, details of the settlement, and any special conditions. The completed plan after compensation is finalized, is sent to the Bank for approval, and after approval, the final document is published for public consumption. Apart from fulfilling due diligence requirements, making the RAP available to the public ensures transparency in the process. In the event that it is less than 200 farmers, an **ARAP or Adjusted Resettlement Plan** is employed.

In the event that any PAP has any issue at any point in the process, there are **Grievance Redress Mechanisms** outlined in the DVRP's Resettlement Framework (section 15) following the Banks's Resettlement Policy to allow any PAP to voice their concerns on any aspect of the project process that affects them, and to receive some form of redress. This process is facilitated by the PCU Social Safeguards officer and would ensure that the grievance is reported and recorded, there is a designated person responsible for responding to it, and that a firm timeline is specified to address the issue. There would

also be a monitoring mechanism to ensure the effectiveness of the response and the affected party's satisfaction.

6.9.2 Compulsory Acquisition of Key Lands for the Project

The consulting engineers along with the DIPE can identify the key lands required to facilitate the road project. The Planning Department which resides under the Ministry of Agriculture, Fisheries, Physical Planning, Natural Resources and Cooperatives would prepares the memorandum to the Cabinet of Ministers providing the request for the acquisition of lands. The process of compulsory acquisition by the Government occurs when there is an overriding national need or that there are many heirs, or owners who may not be fully willing to sell.

The formal compulsory acquisition process for any lands required to accommodate the service access and works on the crossing would have to be guided by **the Land Acquisition Act No.12 of 1945 Amended by Act 11 of 2000**. The Authorized Officer to execute the surveying and acquisition of the required properties is the Chief Surveyor of the Survey and Mapping Department of the Department of Physical Planning in the Ministry of Agriculture.

Generally, the formal compulsory acquisition process would involve the following process:

1. The approach by an agency or department to the relevant Minister or to write directly to the Minister responsible for Physical Planning and make a request along with justification for the acquisition of a particular area of land for a particular use that they want to use it for.
2. The agency's Minister can choose to prepare a memo to the Cabinet of Ministers or the Minister of Physical Planning can do so and submit to the Cabinet.
3. If land in question is being dismembered, when it goes to Cabinet the memo will be for notification of the intent to acquire. This notification must be presented in two consecutive issues of Gazatte.
4. After 2nd publication of notification the chief surveyor or the authorized officer will commence the survey. After the survey is done block and parcel numbers will be issued and the survey properly lodged. Land registers will be produced

5. Another memo will be produced for cabinet on the declaration of the accusation. This will be published in another two issues of the Gazatte. The property will now belong to the Crown and be designated for use or management by a specific ministry or agency.

6. After that the chief surveyor and the land owners will meet to negotiate the compensation for the acquired property.

7. Once compensation arrangements are successful the agency of interest will now be able to access the property and carry out the project.

8. The full compensation may not necessarily occur before the land is owned by the Crown and the project commences. However, it must be noted that under the world bank policies compensations must be completed before the project commences or any further disbursement from the world band on the project.

9. The timeline for compulsory acquisitions can vary depending on the length of time of the survey or cabinet response. Sometimes, two to three months can be occupied by the survey and another three to four months can follow with negotiations and agreements before the process can be completed.

DIPE can opt to deal directly with landowners if required and negotiate if the landowner agrees to sell. Compulsory acquisition would occur if land owners do not wish to sell or if there are a number of heirs. DIPE can approach the Ministry of Agriculture which also includes Planning and communicate such plans with both permanent Secretaries. If funding for this process was not a part of the initial proposal to the World Bank and a request was made, once the World Bank has been informed that payment has been made then funds may be provided as reimbursements. If the acquisitions have already been identified as part of the project cost, then that funding will be available for drawing down.

6.10 Determined Social and Economic Impact

There was overall strong support for rehabilitation of the road with the majority of Millet respondents expressing concern about road surface condition and the conflict that with pedestrians when the drivers attempted to avoid the potholes. The Millet school is one of the better performing at the common entrance examination with 74% pass performance above the mean. The teachers assign blame to the road condition for the low enrollment given the schools performance.

Strong support was expressed by the Anse La Raye residents with their overwhelming concern of the loss in food production and tourism opportunities that the forced closure of the road contributed to. The proposed road is expected to have a **positive impact** on national economic and social development as well as on the receiving environment through employment generation. During the construction as well as the operational phases of the project.

SECTION 7

ENVIRONMENTAL IMPACTS-

7.0 Construction Phase Positive Impacts

7.1 Local employment, skills development and other economic benefits

Overall, the project will make a significant positive contribution during both construction and operations phases to the communities of Sarrot, Jacmel, Vanard and through to Millet who use the roads (See Tables 7 and 8). The benefits will be both direct and indirect, and short term. The benefits during the construction phase will increase with the use of labour-based methods of construction when supported by work contracts that favour community members. This economic incentive and employment opportunity will serve to transfer as much of the benefit of construction to local people who are unemployed, as possible. Although short-term during the construction phase that will likely cover a 12-month period, benefits expected will include:

- Employment for 50 people with at least (60%) expected to come from the various local communities (direct employment benefit).
- Create and support to local entrepreneurs, especially small, medium and micro in areas such as vending by women (indirect economic benefit) from the sale of cooked foods, snacks and drinks.
- Local economic development and alternative livelihoods especially in rural and where economic activities are limited (direct other economic benefit)
- Provide transfer of construction skills to workers in the community (direct employment benefit)
- Engender a sense of ownership and engagement of local communities in the maintenance of the infrastructure (indirect social benefit)
- Creates and supports local entrepreneurs, especially small, medium and micro enterprises (indirect economic benefit)
- In the long term with the land acquisition it is expected that long term benefits will include improved land tenureship (direct benefit).

- stimulate economic growth in the area by increasing the potential of lands in the area for development.

7.2 Increased access to the community.

The proposed will reduce transportation costs since the road serves commuters from the communities of Sarrot, Jacmel, Vanard and through to Millet, but there is currently poor motorable access to traverse directly to Anse La Raye. The proposed road rehabilitation will improve the movement through Vanard to Anse La Raye and if desired then through to Millet road. Good road infrastructure was seen as essential for the ease of commuting for respondents and emergency vehicles. Another explanation was that, good roads will make schools and health facilities more accessible. Some other important reasons listed include the following: enhanced farming activities, greater employment opportunities, business opportunities and tourism impact of road transportation on some selected major indicators of rural development. This positive impact would be direct, long term and significance.

Agricultural livelihoods and food and nutrition security: Since the majority of respondents surveyed are involved in agriculture the operation of the road is expected to help them transport their produce (root crops-dasheen and yams, sweet potatoes, plantains, and vegetables) to market in a timely manner. This would likely revive agricultural production along the road, reinitiate livelihoods, and improve supply of fresh fruits and vegetables available locally. This positive benefit would be short term and significant.

Tourism entrepreneurship: Once the road is in operation, it is expected to create and provide support to local entrepreneurs (primarily women), especially small, medium and micro in areas such as vending of crafts, fresh fruits and drinks to tourists involved in touring in the area. This impact would be positive indirect and long term.

7.3 Construction Phase Negative Impacts

7.3.1 Human Impacts

There were a number of social negative impacts related to the proposed project listed by community members that included:

Safety of children traversing the area to and from school along the roadside at present. This adverse threat could be short term and negative, and not carry to the operations phase, if road rehabilitation includes walking lanes/ sidewalks.

Nuisance dust raised by the road surface during construction is another adverse and short impact noted but it is likely during operations that while more vehicles would use the road, the concentrated dust levels associated with construction would be lessened. As a result, while this impact would remain, a direct adverse impact, it would reduce to one of minor levels.

During the construction phase, soil erosion of cut slopes, construction materials and back fill could be **carried through runoff** into the nearby waterways and result in the increased siltation of rivers. This is a medium-term threat that is direct and significant.

With the **increased traffic** associated after the upgrade to the existing road, these is likely to be increased movement of the heavy trucks travelling to the nearby quarries. These trips over time will increase noise and traffic flow into the area. This benefit is seen as indirect, adverse but of a minor nature. While in the long term these heavy trucks and their loads could result in the destruction of the road surface.

7.3.2 Biological impacts -

Wildlife: There are no critically endangered flora and fauna on the site; however, four (4) endemic bird species occur within the study area and the development will impact their habitat. This impact is short term, significant and direct as noise and dust from the road construction activities impact the fauna; in

the immediate vicinity. During construction, noise and dust pollution on the site will result in a short-term reduction of birdlife in the area. Fauna species will generally move away from impacted areas. Therefore, some habitat protection and use of natural vegetation as a buffer zone will be necessary to mitigate this impact.

Vegetation cover: The study area is a consortium of introduced and indigenous forest tree species. This vegetative survey did not record any rare or endangered species. No pristine areas were observed during the field activities. This may be due to the long history of cultivation with introduced fruit trees and other crops. Indigenous tree species are the dominant cover, while the introduced species are mainly food crops including food trees and multipurpose plants. All tree species will be affected by dust the most and some sensitive species may die if the dust load is too heavy. This impact while significant and negative, will be short term. Therefore, some dust and noise protection will be necessary to mitigate this impact.

7.3.3 Biophysical Impacts

Soil erosion: Steep slopes with drops in some areas along with narrow valley areas and punctuated by hilly terrain rising describes much of the proposed road to be rehabilitated and traverses the watershed of the Roseau river and one can observe the slopes created by mountain rises that are steep with cuts that appear unstable. Soils are thin comprising of It comprises Belfond Clay Loam, Bocage Clay and Marquis Clays with relatively good drainage. The soils over the roadway and corridor and immediate surroundings are shallow and because of the high rainfall volumes noted in this area, soil erosion is a major problem. This problem is evident due to increased river siltation and reduction in water quality. This impact is significant, negative and long term. As a result, mitigation efforts will be necessary to mitigate this impact.

Deforestation: Some vegetation will be removed as part of the road upgrade and realignment planned. Removal of natural vegetation is expected that this impact will be negative and significant especially if there is removal of any riparian vegetation near and along the riverbanks. As a result, mitigation efforts will be necessary to mitigate this impact.

Water Pollution:

Water pollution may be caused by wastewater from washing of loose excavated materials, discharge of untreated domestic and worker wastewater. The concerns raised by the villagers about the effects of quarrying on the coastal ecosystem was reviewed during this exercise. The consultant found there to be studies into this matter, one of which found "a stable rate of terrestrial sediment accumulation downstream of the Anse La Raye watershed during a time where more watershed area was developed into farms and quarries, supports the idea that little sediment produced from those land uses was carried to the coastal zone. While it may be surprising that the conversion of forest to farming and quarries seen in Anse La Raye did not increase sediment accumulation rate near downstream reefs substantially", [6]

Water sampling will be recommended to be conducted where works will affect the receiving water bodies in the area. These results will serve as the basis for any change in future assessment of water quality and also as a guideline for the contractors and consultants in the design and treatment of site generated waste water facilities and actual solid and liquid waste

7.3.4 Proposed Mitigation/Management Measures:

- Vegetative cover including forests is the best protection for soil against rain, wind and sun and should be used as far as possible on the site. Areas with very steep slopes should be avoided and remain under forest cover to minimize soil exposure and provide habitat for wildlife.
- In view of the forecasted food crisis, fruit trees along the road area must be retained for the benefit of humans and wildlife alike.
- Planting of new fruit trees should be encouraged especially mangoes and Hog plum to replace those that will be lost in the immediate construction impact zone. Their ecological significance

[6] https://www.researchgate.net/figure/Results-of-analysis-of-the-Anse-La-Raye-core-Saint-Lucia-eastern-Caribbean-a_fig2_261839565

as food for wildlife in the area cannot be understated. These trees should be planted immediately in order to take the place of the ones that will be lost in land clearing.

- Vegetation surrounding the road corridor should be kept as a buffer for wildlife, to reduce noise and will also act as a dust trap. Trees should be retained. If possible, as many of the fruit trees such as Mango and other trees like Hog plum should be retained. They can serve to attract birds and thus compensate for any loss of habitat consequent on land clearance.

- In the event that replanting is done as a mitigation measure or to improve aesthetics, as far as possible native species should be used.

- Vegetation on the base of steep slopes and riparian vegetation should be preserved to avoid accelerated erosion and landslides.

- Disturbed sites should be covered as soon as possible using temporary or permanent vegetation and mulches, as this is relatively inexpensive.

- As much as possible all large mature trees on the slopes should remain as this will help in reducing soil erosion.

- The removal of trees in the immediate locations where the proposed retaining structures will be built should be well planned and monitored. Only those individual trees which will pose a hindrance to construction or a hazard to the completed road corridor should be removed.

- The riparian vegetation along the riverbanks likewise plays a very important role in riverbank stability, reducing erosion and siltation within the river and by extension the marine environment. Riverbank buffers also serve as corridors for movement of wildlife, recreation, soil and water conservation, and improve the aesthetics. In areas where gaps exist, trees should be planted for riverbank stability. Preserving natural vegetation is always preferable to replanting as existing vegetation is perfectly adapted to local conditions. It is recommended to re-vegetate using indigenous plant species as they are readily available and acclimatized to area conditions

- Water sampling will be recommended to be conducted where works will affect the receiving water bodies in the area. These results will serve as the basis for any change in future

assessment of water quality and also as a guideline for the contractors and consultants in the design and treatment of site generated waste water facilities and actual solid and liquid waste

7.4 Potential Impact on the Physical Environment

In this section, the potential impacts of the proposed road construction activities, which could cause significant environmental concerns, are identified and discussed. This discussion will form the basis for environmental management planning and will lead to designing of an EMP for this project.

The road construction operations will involve changes in the topography, landform, hydrology, bio-diversity and geo-diversity of an area either during or after such activities. With its associated retaining structures these new landform features could affect negatively or positively the visual and landscape characteristics of the original site and its surroundings, as well provide providing economic opportunities and for new land uses and challenges to rehabilitation and regeneration.

Based on the field study, the communities and surroundings located within the site are considered within potential impact zones of the proposed road construction. These include Venus, Vanard and Durandeau, Millet and Anse La Raye.

1) The project activities that are likely to cause potential impacts on environment are as follows:

2) Excavation operations
3) Placement of imported crushed stone
4) Associated drainage infrastructure
5) Retaining wall construction

A brief description of these activities and associated environmental impacts are discussed below.

7.4.1 Road Operations

This involves, excavation and handling & transportation of rock and waste materials, change in water regime. The likely effects of these activities are:

- Land degradation;

- Deforestation;
- Visual intrusion of land;
- Fugitive dust emission;
- Higher run-off during rains;
- Higher noise and vibration levels; and
- Human health risks.

7.4.2 Associated Infrastructure

The associated facilities for the road project include:

- Storage and handling facilities for fuel, lubricating oils and workshops
- Waste mangement
- Water supply
- Telecommunications
- Power supply

The environmental impacts associated with these infrastructural facilities are described in the following sub sections.

7.4.3 Storage & Handling Hazardous Chemicals

Storage and handling of fuel, lubricating oil & grease, and explosives, are areas of concern from an environmental, health and safety point of view. Vehicle maintenance and repairing workshops equipment and machines would generate waste oils; oil and grease and suspended particles which may also find their way into the wastewater streams. Oil and grease spillage may also contaminate the soil in and around the workshop area. These negative impacts are expected to be direct, short term and significant.

7.4.4 Solid Waste

Offices and other community facilities will mainly contribute towards solid waste and sanitary wastewater. A proper collection, transportation and disposal system will have to be developed for solid waste management. Also, sanitary wastewater will have to be treated to avoid any health hazards due to water borne diseases. These negative impacts are expected to be direct, short term and minor.

7.4.5 Water Supply

There is need for domestic water at the site. Water requirement for the project will have to be met either through piping potable water, and combination of pumping water from the river based on common practices. Since there is ease of getting water to the site, this change is not expected to have any significant impact.

7.4.6 Telecommunications

Telephone facilities will be have to be provided in the offices, workshop, etc. The use of cellular phones may be an option but if planned otherwise telephone infrastructure is not expected to cause any significant impacts.

7.4.7 Power supply

There is the option to source power from the main power supply which runs through the area and this is not expected to have negative significant impacts.

7.4.8 Climate

Micro-climatic conditions such as temperature, rainfall, wind-speed and relative humidity, etc are regional phenomenon and are affected only if there are significant variations in the environmental set up. It is not anticipated that climate in the area will be significantly affected

7.4.9 Ambient Air Quality

The construction operations will generate high levels of suspended particulate matter (SPM) and to a very limited extent SO_2, NO_x, and CO due to blasting (using explosives), fuel oil combustion, etc. the increased traffic will generate increased NO_x emissions. Transportation of fine sized aggregates from the nearby and offsite quarries to site area will also contribute to dust emissions to some extent but is not expected to be significant.

Vehicular movement within the project site is expected to marginally contribute NO_x and CO concentration. Regular maintenance and engine tuning of vehicles used within the area so that the emission levels remain within appropriate levels would be useful. SPM levels will be higher within the active operational areas. However, the ambient air quality may be more directly affected if dust suppression measures are utilized. These negative impacts are expected to be direct, short term and minor.

7.5 Occupational Health Hazards Due to Dust Pollution

As suspended solid particles or dust disintegrates, the process can result in major health problems for people. The smaller the particle size the higher is the chemical and biological reactivity, resulting in increased toxicity than the parent lump. These micro-sized particles, once air-borne, are extremely difficult to be collected or trapped. Due to the `minute size of the particles, the ambient environment remains clear giving a deceptive sense of security to the workers and the nearby households.

This restorable dust has serious impact on the health of the workers. Lung functions are impaired due to both respirable and non-respirable dust particles. Chronic exposure leads to respiratory illnesses like asthma, emphysema, severe dyspnea (shortness of breath), bronchitis in extreme cases. The effect of dust may be harmful to the human health, short term, direct and significant. This can also negatively affect any nearby resident exposed to such air quality.

7.5.1 Noise Environment

During construction, there would be various sources of noise in the area. These sources would be:

- Excavation with heavy equipment
- Operation of heavy earth moving machinery
- Vehicular movement; and

Noise due to vehicular movement will be intermittent, but will also add to the background noise level.

Operation shovels, dumpers, pay loaders and bulldozers involve noise generation above 90 dB(A), which is the prescribed Threshold Limit Value (TLV).

The sound pressure level generated by a noise source decreases with increasing distance from the source due to wave divergence. It is expected that the noise levels generated by the proposed construction activities will negatively affect existing noise receptors because the homes are aligned with the main road that has to be improved. It is not expected that there will be any noise activities

during the night. As such it is not anticipated that there will be any negative noise impacts at the community and its households.

The impacts over the surrounding habitat can be minimized by adopting adequate precautions during noisy operations and also by properly scheduling it. In addition the effect of increased noise levels due to excavation equipment and roller equipment in the immediate vicinity of communities also needs to be considered. These negative impacts are expected to be direct, short term and minor.

7.5.1.1 Occupational Health Hazards of Noise Pollution

It is noted that the noise levels in many situations would be above TLV. Exposure to noise levels, above TLV, has been found to have detrimental effect on the workers' health. Workers working for more than 4 to 4.5 hours per shift would generally be greatly affected, unless suitable mitigation measures are taken. The adverse effects of high noise levels on exposed workers may result in:

- Annoyance
- Fatigue
- Temporary shift of threshold limit of hearing
- Permanent loss of hearing; and
- Hypertension and high blood cholesterol, etc.

When noise in the form of waves impinges the eardrum, it begins to vibrate, stimulating other delicate tissues and organs in the ear. If the magnitude of noise exceeds the tolerance limits, it is manifested in the form of discomfort leading to annoyance and in extreme cases to loss of hearing. Detrimental effects of noise pollution are not only related to sound pressure level and frequency, but also on the total duration of exposure and the age of the person. **Table 7.**below gives frequency levels and associated mental and physical response of humans.

These impacts are expected to be direct, short term and minor with mitigation.

Table 19: Noise Exposure Levels & Its Effects

Noise Levels (dB(A))	Exposure Time	Effect
85-90	Continuous	Annoyance and irritation
90-100	Short term	Temporary shift in hearing threshold, generally with complete recovery
Above 100	Continuous ,Short term	Permanent loss of hearing Permanent hearing loss can be avoided
100-110	Several years	Permanent deafness
110-120	Few months	Permanent deafness
120	Short term	Extreme discomfort
140	Short term	Discomfort with actual pain
150 and above	Single exposure	Mechanical damage to the ear

7.5.1.2 Ground Vibrations

Due to compaction of the road, the vibrations can cause damage to nearby physical structures if appropriate control measures are not adopted. Ground vibrations from compaction with heavy rollers may be expressed by amplitude, frequency and duration of blast. The variables, which influence ground vibrations, are controllable and non-controllable. The non-controllable variables include:

- general surface terrain;
- type and depth of overburden; and
- wind.

These negative impacts are expected to be direct, short term and significant.

7.6 Water Environment

The existing road traverses through an area with natural watercourses. The drainage from the area ends up in the river generally to the west along the road way. During heavy rainfall, the area is prone to surface runoff and soil erosion in some parts that ultimately will lead to the river systems below.

During the rains the storm water may carry solids and debris from the unstable sections and the loose material may reach the river in the absence of any control measures. The rehabilitation of excavated land and final land restoration will, however, stabilize the drainage pattern also. These negative impacts are expected to be direct, short term and minor.

7.6.1 Impacts on Surface Water

The potential impact on the surface water quality is likely to be due to higher load of suspended solids. Sources of suspended solids would be:

- Discharge of runoff during rains to the surface water channels;
- Wash off from waste dumps and stock piles during rainy season;
- Oil spillage from maintenance workshops; and
- Oil effluent from ancillary buildings (canteen, etc).

7.6.1.1 Wash-off from stockpiles

During heavy rainfall, the wash-off from the material stockpiles will lead to any adjoining surface water body. This is likely to increase the suspended solids within the water samples. Therefore, stockpiling areas should be so established and developed, so as to prevent soil erosion along with the run-off.

7.6.1.2 Oil Spillage from Maintenance Workshops

Oil spillage from the workshop in wastewater generated will add to the pollution load resulting in oil and grease contamination of surface water from site facilities. There may be need for some form of treatment to separate the oil from the wastewater. Removal of the oil and treatment of the wastewater before discharge will ensure that there is negligible impact on the environment.

7.6.1.3 Effluent from Ancillary Facilities

Sanitary wastewater will generated from various facilities such as canteens, toilets, offices, etc. This sanitary wastewater, if discharged without proper treatment, could have adverse impact on the surface and ground water quality and could lead to water borne diseases, etc. control of waste water for negative effects on the surrounding quality is essential to prevent and control the pollution of surface water. Cumulatively, these negative impacts are expected to be direct, short term and minor.

7.6.1.4 Impact of Polluted Water

Polluted water generally contains objectionable odour and colour. It may also be acidic, toxic and highly turbid. Such water is unfit for drinking or any other use. In some cases these may also contain pathogenic microorganisms, which pose a potential health hazard as this water may cause water-borne disease.

The polluted water may not be useful for animal husbandry, re-vegetation and human or animal consumption; and high turbidity, oils and grease film on water may not allow proper oxygenation of surface water. Further, high turbidity may prevent sunlight to enter into the water body to promote photosynthesis of aquatic plants. So polluted water may affect the aquatic life. It is not expected that large volumes of water will be utilized and if treated wastewater generated is not expected to affect water downstream of the working areas when adequately controlled. These negative impacts are expected to be direct, short term and minor.

7.6.1.5 Impacts on Ground Water

The potential impact on the ground water would be negligible, as the road is located at an elevated topography. Given the nature of the substrate in the area and with proper run-off management the likely chances of the contaminants reaching groundwater does not appear to be significant provided that proper channels are placed to direct the water.

7.6.1.6 Impact on Drainage Pattern and Siltation

There are observed springs in the immediate vicinity of the road. There were also observed to be dry ravines which from all indications carry large volumes of rainfall during heavy rains. The road improvement is not expected to significantly affect the flow of water in this area. These negative impacts are expected to be direct, short term and minor. It is not anticipated that there will be a siltation problem if proper control measures are adopted to control runoff.

It is not anticipated that there will be a siltation problem if proper control measures are adopted to control runoff.

7.7 Land Use

The proposed improvement to the existing road will minimally change the topography and the landscape of the area. The construction of the road and retaining walls will impact the landscape but with proper construction and drainage severe change is not anticipated.

Except for the retaining wall construction, no major topographical change is likely to take place except some leveling and back-filling and construction of structures. No adverse impacts are anticipated on land use of the periphery due to the project. There will not likely be any significant amount of land loss from agricultural production given to the topography improvement However there is a likely instance for road realignment that will require permission from the adjoining land owners to utilize an identified parcel for road realignment.

7.8 Soil

Impact on soil will be localized i.e. around and along the road site. However given the existing excavated slopes and the exposure of the soil cover, the likelihood of any adverse impact from soil erosion and disturbance is likely. However, the impacts that will occur are reversible as vegetative cover can be developed along all the exposed slopes.

7.9 Solid Waste Disposal

A large volume of plant (organic material) during clearing/excavation is expected in significant quantities from the project. Such waste can be utilized on nearby disposal sites. Other domestic waste will be disposed as municipal waste.

7.10 Chance Cultural Finds / Discovery of Antiquities

There is always the possibility that during excavation works there may be the unearthing of historical artifacts that have remained buried from past settlement. The damage to these items would mean the loss of antiquities and a negative impact to the preservation of the island's native history. This area however is not known for evidence significant archaeological activity or any the location of any monuments or past discoveries. In the event of any discoveries the Archaeological and Historical Society would be consulted. The Saint Lucia National Trust would also be involved only after discussion and agreement with the Archaeological and Historical Society.

7.11 Potential Impact on the Physical Environment During the Operations Phase

In this section, the potential impacts of the proposed road operations activities, which could cause significant environmental concerns, are identified and discussed. This discussion will form the basis for environmental management planning and will lead to designing of an EMP for this project.

Road construction and improvement as planned for the proposed project will improve the transport network on the island by adding addition 12.5 km. With this rehabilitated road infrastructure, it is expected that there would be an overall increase in direct GHG emissions from equipment and vehicle use associated with the road. Further, while overall rural road will have positive social impacts such as increased opportunities for education and health care, there can also be negative impacts that include increased transmission of diseases and traffic accidents.

7.12 Road Operations

This involves use of the road by vehicles that would involve transportation of residents in and out of the community, use of the road as an alternative pathway to Millet, use by the tourism sector (with increased tours in the area) and increased use of the road by quarry vehicles for the transportation of rock and waste materials. Likely indirect effects of these activities are:

- Deforestation;
- Increased land development in the area with improved access
- Fugitive dust emission with more vehicular traffic on the roads which can lead to health issues ie respiratoryissues;
- Higher run-off during rains with 8.75 km of impermeable surface that would change the movement of water in the area and divert runoff quickly through roadside drains and culverts;
- Higher noise and vibration levels with greater road traffic; and
- Human health risks from more movement of people into the community

Cumulatively, these negative impacts associated with road operations are expected to be indirect, long term and moderate.

7.13 Summary of Potential Impacts with and without Mitigation Measures

The summary of potential issues is outlined. Tables 20, 21, and 22 below and summarizes the potential adverse environmental impacts during the construction and operations phases on the four main categories of resources and factors identified including air quality, water resources, noise levels, ground vibration, hydrology and drainage pattern, land use and soil characteristics, and health. Table 23 identifies mitigation measures which could be adopted.

Table 20 Summary of Potential Environmental Impacts Impact on Flora and Fauna

Component	Impact	Source of Impact	Probability of Occurrence (L.M H)	Receptor	Magnitude				Overall significance		
					Frequency	Duration	Extent	intensity	Receptor sensitivity	Magnitude	Impact significance
Fauna	Change in species population, abundance, distribution	Clearing Forest vegetation Introduction of barriers to movement	H	Mammals reptiles. birds	1	2	2		1	Medium (2)	Medium (6)
	Disruption/ disorientation by noise	Use of motorized equipment	H	Mammals reptiles. birds	1	2	2		1	Medium (2)	Medium (6)
	Unintentional kills	Ground disturbance	H	Small mammals reptiles	1	2	2		1	Medium (2)	Medium (6)
	Increase risk to human and wildlife conflict	Alienation of wildlife in their natural habitat, specifically, the Saint Lucia Fer de lance, due to increase hazard to human and birds becoming pest to farmers and other future potential landuse change	H	Reptile (snakes) mammals and birds	1	2	2		1	High	High
	Wildlife prosecution & Road Kills	Deliberate harm and killing and ~~U~~use of motorized equipment	H	Large Mammals reptiles	1	2	2		1	Medium (2)	Medium (6)

		Human presence		Ground dwelling birds							
	Habitat loss and degradation	Fragmentation of habitat and loss of food source due to direct, during construction and increase in opportunity for change in land use)	H	Birds, reptiles and mammals	2	3	2		1	Medium	Medium (6)
	Deteriorated quality of surface water	Use of chemical substances Chemical spills	M	Reptiles amphibians, fish	1	2	2		1	Medium (2)	Medium (6)
	Introduction of alien invasive species	Increase pathway for alien invasive species, reptiles, a major threat to biodiversity in Saint Lucia. These include the inter alia mammals, cats, dogs, pigs mongoose, rats ect.	H	native birds, reptiles, mammals, insects	1	2	2		1	high	High
	Deteriorated quality of soil Increased risk of diseases spread to fauna	Use of chemical substances Human presence	M	Reptiles amphibians small mammals large mammals	1	2	2		1	Medium (2)	Medium (6)
	Increased risk of diseases spread to fauna	Presence of humans sanitation and waste management	M	Large mammals, Birds, fish	1	2	2		1	Medium (2)	Medium (6)
Flora	Change in species population,	Clearing Forest vegetation Poor management of invasive species	H	Forest edge species	1	2	2	1	Medium (2)	Medium (6)	Medium negative

	Increased risk of wildfire	Deliberate for land clearing and tossing of cigarettes and other combustive agents	H	All vegetation and general biodiversity	1	2	2	1	1	Medium	Medium
	Habitat modification	Opening canopy	H	All vegetation	1	2	2	1	Medium (2)	Medium (6)	Medium negative
	Proliferation of invasive species	Proliferation of invasive species	H	All vegetation	1	2	2	1	Medium (2)	Medium (6)	Medium negative
	Deteriorated quality of surface water	Use of chemical substances	M	All vegetation	1	2	2	1	Medium (2)	Medium (6)	Medium negative
	Reduce climate change adaptation and mitigation potential	deforestation and forest degradation activities contributing to reduce resilience to the vagaries of climate change and increase in the release in green house gasses	M	All forest	3	2	2	3	3	low	low
	Deteriorated quality of soil	Use of chemical substances Human presence	M	All vegetation	1	2	1	2	Medium (2)	Medium (6)	Medium negative
Geology and soil	Contamination of soil	Waste management Operation of machinery Vehicle/ machinery repairs	H	Soil, Plants and animals dependent on soil Ground water	1	2	1	3	Medium (2)	Medium (7)	Medium Negative

	Changes in physical chemical properties (temperature, oxidation, aggregation)	Opening canopy Clearing vegetation	H	Soil Plants and animals dependent on soil	1	2	2	2	Medium (2)	Medium (7)	Medium Negative
	Erosion	Vegetation clearing	H	Cultivated areas Communities Surface water	1	1	2	2	Medium (2)	Medium (7)	Medium Negative
Atmosphere	Increased levels of particulate matter (dust)	Excavation and road works	H	Workers Community Plants and animals	1	2	1	3	Medium (2)	Medium (7)	Medium Negative
	Deteriorated quality due to emissions of gaseous pollutants	Operation of vehicles & equipment Construction chemicals	H	Workers Community Plants and animals atmosphere	1	2	2	2	Medium (2)	Medium (7)	Medium Negative
	Increased levels of noise	Excavation and road works Movement of vehicles Operation of equipment	H	Workers Community Wildlife,Domestic animals	2	1	1	2	High (3)	Medium (6)	Medium Negative
Water resources	Changes in physical chemical properties (Contamination , sedimentation)	Waste management Operation of machinery Vehicle/ machinery repairs	M	Aquatic fauna and flora Wildlife and human Water users	1	2	2	3	High (3)	Medium (8)	High Negative

	Changes in fish populations (mortality, destruction of spawn sites, blockage of passage)	Blockage of water courses Sedimentation Erosion Water contamination	M	Aquatic fauna and flora Wildlife and human Water users	1	2	2	3	High (3)	Medium (8)	High Negative
	Changes in hydrology/ drainage	Inappropriate culvert size or placement Blockage of water course	L	Cultivated lands, buildings along road, Wildli fe	1	1	1	2	Medium (2)	Low (5)	Medium Negative

Table 21 Impact on Physical Environment-Construction Phase

	Deteriorated quality of surface water	Use of chemical substances	M	All vegetation	1	2	2	1	Medium (2)	Medium (6)	Medium negative
	Deteriorated quality of soil	Use of chemical substances Human presence	M	All vegetation	1	2	1	2	Medium (2)	Medium (6)	Medium negative
Geology and soil	Contamination of soil	Waste management Operation of machinery Vehicle/ machinery repairs	H	Soil Plants and animals dependent on soil Ground water	1	1	1	2	Low (1)	Medium (5)	Medium Negative
	Changes in physical chemical properties (temperature, oxidation,)	Opening canopy Clearing vegetation	H	Soil Plants and animals dependent on soil	1	1	1	2	Low (1)	Medium (6)	Medium Negative
	Erosion	Vegetation clearing	H	Cultivated areas Communities	1	1	1	2	Medium (2)	Medium (7)	Medium Negative
Atmosphere	Increased levels of particulate matter			Workers Community			1	3	Medium	Medium	Medium
	Deteriorated quality due to emissions of	Operation of vehicles &		Workers Community			2	2	Medium	Medium	Medium
	Increased levels of	Excavation and road works Movement of vehicles		Workers Community			1	2	Medium	Medium	Medium

Cultural/ heritage	Loss of cultural and heritage artifacts	Excavation of areas around road and road construction	L	Community Island	3	3	3		Low (3)	Low (3)	Medium Negative
Water resources	Changes in physical chemical properties (Contamination , sedimentation)	Waste management Operation of machinery Vehicle/		Aquatic fauna and flora Wildlife and human Water			1	2	Medium	Medium	Medium
	Changes in fish populations (mortality,)	Blockage of water courses Sedimentation	M	Aquatic fauna and flora Wildlife and human Water users	1	1	1	2	Medium	Medium	Medium
	Changes in hydrology/ drainage	Inappropriate culvert size or placement	L	Cultivated lands, buildings along road,	1	1	1	2	Medium	Low	Medium

Table 225 Impact on Physical Environment-Operations Phase

	Deteriorated quality of surface water	Use of chemical substance from agriculture production (indirect)	M	All vegetation	1	2	1	1	Low (1)	Medium (7)	Medium negative
	Deteriorated quality of soil	Use of chemical substances Human presence	L	All vegetation	1	1	1	1	Low (1)	Low (5)	Minor negative
Geology and soil	Contamination of soil	Waste management Vehicle/ machinery repairs	L	Soil Plants and animals	1	2	1	1	Low (2)	Low (5)	Minor Negative
	Changes in physical chemical properties (temperature, oxidation, agregation)	Opening canopy Clearing vegetation	L	Soil Plants and animals dependent on soil	1	1	1	1	Low (1)	Low (5)	Minor Negative
	Erosion	Vegetation clearing	H	Cultivated areas Communities Surface water	2	2	1	1	High (3)	Medium (7)	Medium Negative
Atmosphere	Increased levels of particulate matter (dust)	Operation of vehicles	L	Workers Community Plants and animals	1	2	1	1	Medium (2)	Low (7)	Minor Negative
	Deteriorated quality due to emissions of gaseous pollutants	Operation of vehicles	L	Workers Community Plants and animals atmosphere	1	2	1	1	Low (1)	Low (5)	Minor Negative
	Increased levels of noise	Movement of vehicles	M	Workers Community Wildlife, Domestic animals	1	2	1	1	Low (2)	Medium (5)	Minor Negative

Water resources	Changes in physical chemical properties (Contamination , sedimentation)	Operation of machinery and vehicles	M	Aquatic fauna and flora Wildlife and human Water users	1	1	1	2	Low (2)	Medium (5)	Minor Negative
	Changes in fish populations (mortality)	Blockage of water courses Sedimentation Erosion Water contamination	M	Aquatic fauna and flora Wildlife and human Water users	1	1	1	2	Low (2)	Medium (7)	Medium Negative
	Changes in hydrology/ drainage	Inappropriate culvert size or placement Blockage of water course	L	Cultivated lands, buildings along road, Wildlife	1	1	1	2	Medium (2)	Low (5)	Minor Negative

SECTION 8

ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACTS

8.0 Three levels of severity associated with three types of Impact Zones

For the purpose of this EIA study, the consultants established Impact Zones along the existing road. This zoning was devised to add a spatial element to the potential impacts based on the types of resources under threat. As a result, specific areas along the .75km road have been flagged for specific mitigation strategies based on the sensitivity of the resources at that location, the type of resources under threat, and the specific road activities proposed (repair of pavement, realignment of roadway, slope stabilization or drainage improvement) along the road. This allows for identifying the nature of the potential impacts at the construction and operations phases on human (A-Zone), biological (B-Zone), and (C-Zone) biophysical resources as derived from literature review and best practices.

The A-Zone identifies the greatest areas of human impact along the Anse La Raye, the Vanard (Venus) – Anse La Raye Link Road. This area aligns with the linear settlement and runs parallel to the road. A-zone highlights the close proximity between houses and the proposed road project and the recognition that the project will directly affect most households. This is because the road is located virtually on the doorstep of the houses located along the road in this community and therefore almost everyone potentially lives in the impact zone. B-Zone designates the biological resources (such as wildlife and flora zone),and C- Zone highlights areas where the major potential impacts are of a the biophysical dimension.

8.1 Standard Impact Zone

The rationale for the impact zones shown on Maps in Figs. 57-63 below (using the GIS buffering function) identifies areas within the A, B and C zonal areas that are likely to be felt with implications for hydrological characteristics, biodiversity, geo-diversity, community and settlements, ecology, cultural and historic landscape features in this zone is as follows:-

Zone 1: This is an area with the most **critical impact zone. Resources are assessed as being under threats that are very severe and adverse impacts**.

Zone 2: This is the zone of **severe adverse impacts**.

Zone 3: This is the lowest impact zone where **possible but less severe impacts** are likely.

Zone 4: This zone describes areas beyond the 200m radius around the point location. In this zone direct impacts are considered largely non-significant or least expected.

In Zone 4, potential impacts can involve threats to resources that are moved by air or water. For example, the impact of air borne dust pollution and water borne contamination from inappropriate treatment of waste water and other liquid waste contaminants could have implications if carried by surface drainage systems well beyond the outer impact zone. Additionally, the prevailing N.E Trade winds impact the area**.** It is clear that the proposed road works will be located both up and down wind the settlements in the area and as such has implication for the transport of fugitive dust away from settlements. It is also to be noted that the thick forest vegetation overlying and surrounding the road site will serve to trap fugitive dust emissions as well as to serve to absorb noise from sensitive human receptors.

Since the proposed project involves a pre-existing road within a rural community, overall the largest impact zone that has been identified is Zone A (human impact). This is because of the close proximity of the residences to the proposed road project based on the linear settlement form of the communities.

While these Zone A impacts that are shown in red will need to be mitigated, they are assessed as Zone 3 in impact severity (See Figures 59-67). In areas classified as Zone 3, the impact severity of potential impacts can involve threats to resources that are moved by air or water. For example, as noted by residents the impact of air borne dust pollution and water borne contamination from inappropriate treatment of wastewater and other liquid waste contaminants could have severe implications on residents in the community. Additionally, it is clear that the proposed road works will be located both upwind and downwind the settlements and as such has implications for the transport of fugitive dust away from settlements. It is also to be noted that the thick forest vegetation overlying and surrounding the road site will serve to trap fugitive dust emissions as well as to serve to absorb noise from sensitive human receptors.

8.2 Impact significance rating

Quantitative and qualitative methods were used in determination of the significance of impacts.

Potential impacts were then ranked in terms of significance to determine whether each impact is acceptable, requires mitigation or is unacceptable.

The criteria for evaluation of magnitude of environmental and social impacts has been categorised in terms of:

- **Extent is a spatial impact:** evaluates the area of influence on the environment;
    1. on the site, (within 1 km radius of the site)
    2. locally (within 5 km radius of the site);
    3. regionally (district, nationally or internationally).
- **Persistence is a temporal impact:** evaluates the lasting effect of impact on environment
    1. temporary during construction only;
    2. medium term (5 – 10 years or lasting after construction has been completed);

3. long term (>10) or permanent.

- **Intensity: is** the quantifiable effects of impacts, at (Scale of 1 -3; Low , Medium or High).
- **Magnitude** is the combined effects of intensity, duration, frequency of occurrence of event or impact, and anticipated extent of impact.
- **Probability:** Evaluates the likelihood of occurrence of predicted impact on the subject environment on a likert scale (Very Unlikely, Unlikely, Likely, Certain,

  Definite)

	5 – Certain	Almost certain to occur in most circumstances
	4 - Likely	Likely to occur frequently
	3 - Possible	Possible and likely to occur at some time
	2 - Unlikely	Unlikely to occur but could happen
	1 - Rare	May occur but only in rare and exceptional circumstances

Overall Impact Significance: A product of **sensitivity and Magnitude** and is assigned a rating of Low, Medium or High.

Type of Impact: Categorises into direct, indirect or cumulative effects of the specific impact.

Direction: Negative or Positive

Reversibility: Irreversible or Reversible

This exercise has identified a number of locations where careful implementation of the components of the road works can occur but with carefully application of mitigative measures to protect the environment and reduce potential negative impacts.

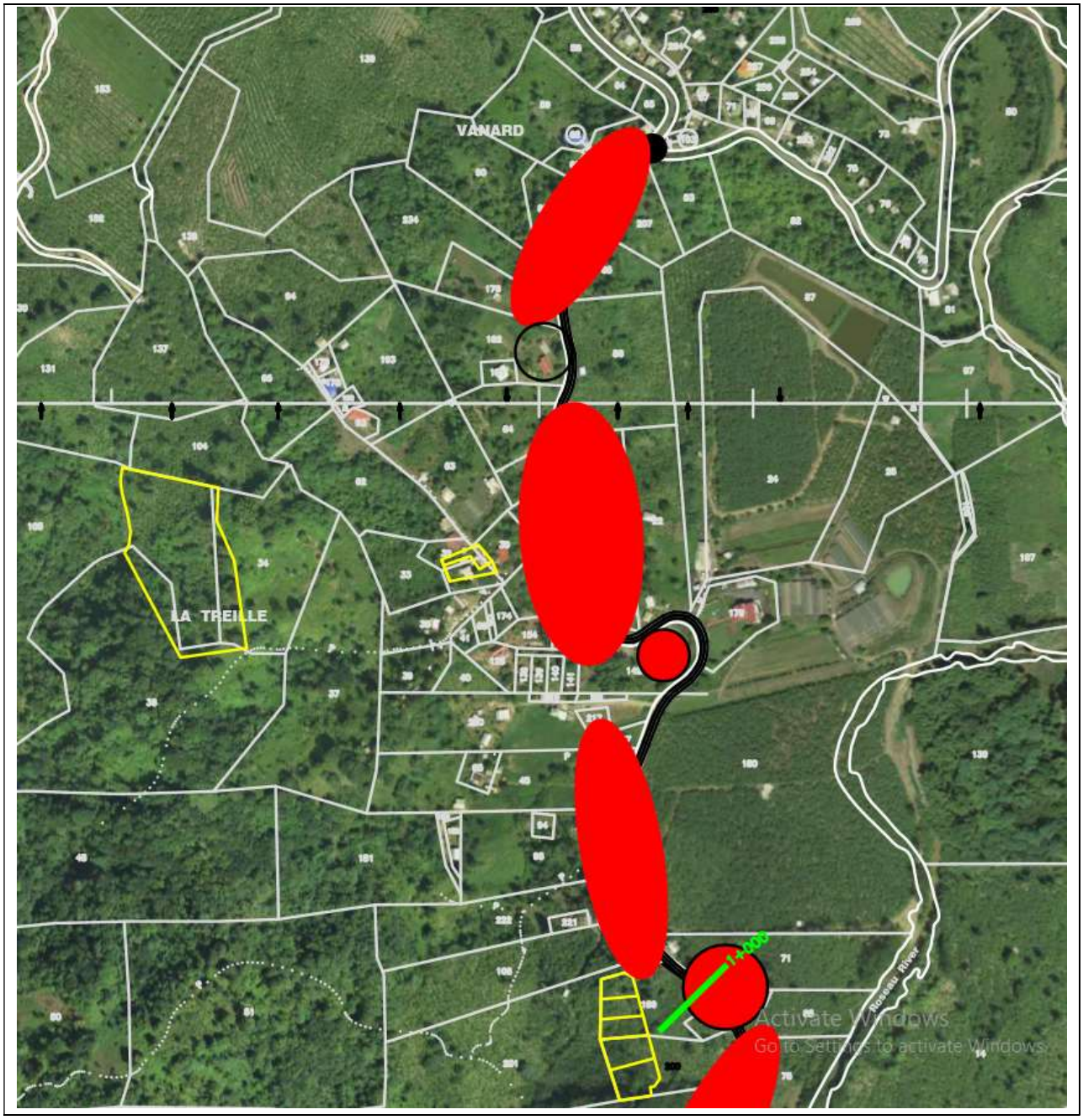


Figure 55 Zone A (greatest human impact) receptors between chainage 0 and 1 km classified as Zone 3 in impact severity because of the close proximity of the residences to the proposed road project (these impacts will need to be mitigated).

Figure 56 Zone A receptors (human impact) between chainage 1 km and 2 km classified as Zone 3 in impact severity.

Figure 57 Zone A (human impact) receptors between chainage 2 km and 3 km classified as Zone 3 in impact severity.

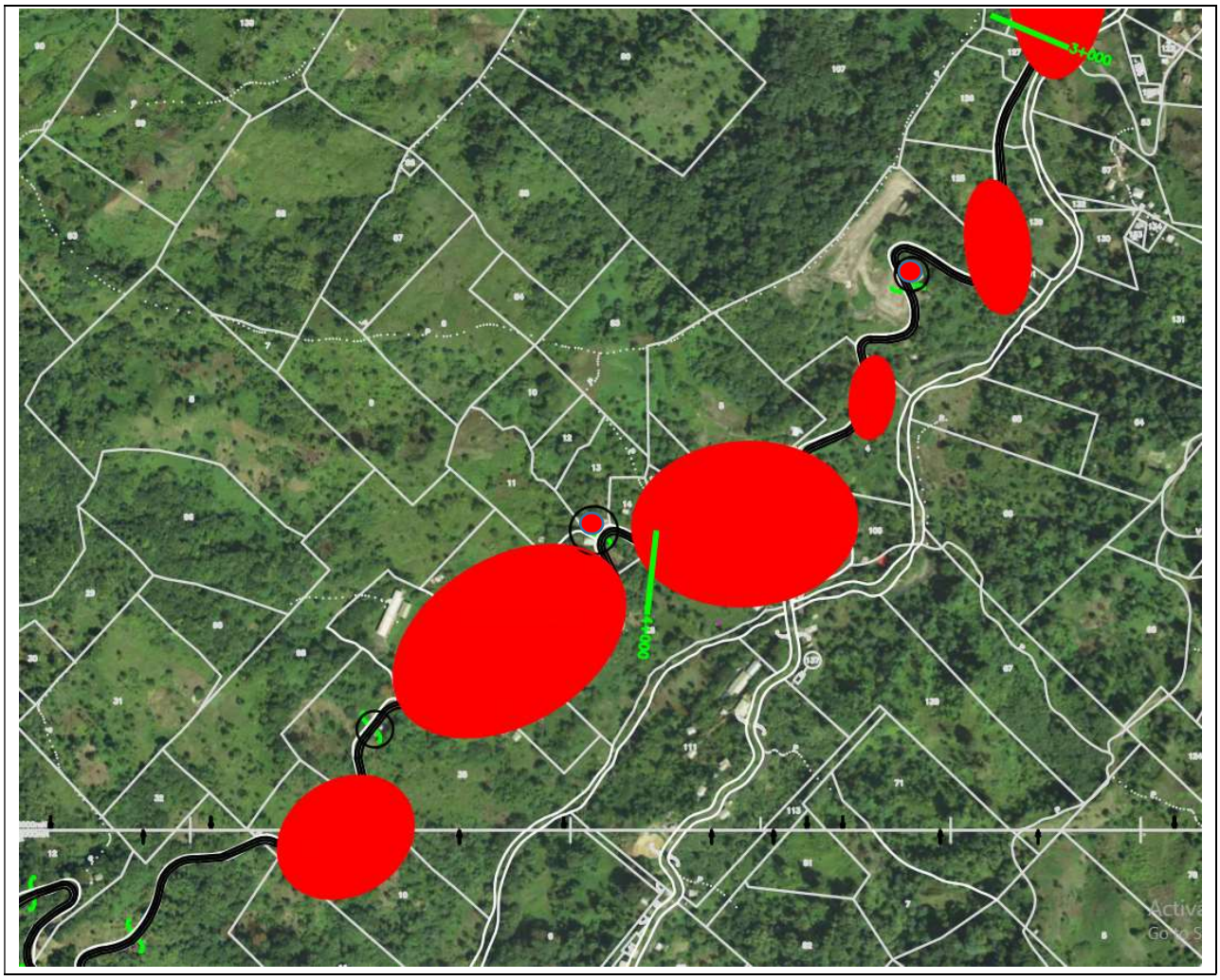


Figure 58 Zone A receptors (human impact) between chainage 3 km and 4 km (Venus Junction with Caico) classified as Zone 3 in severity.

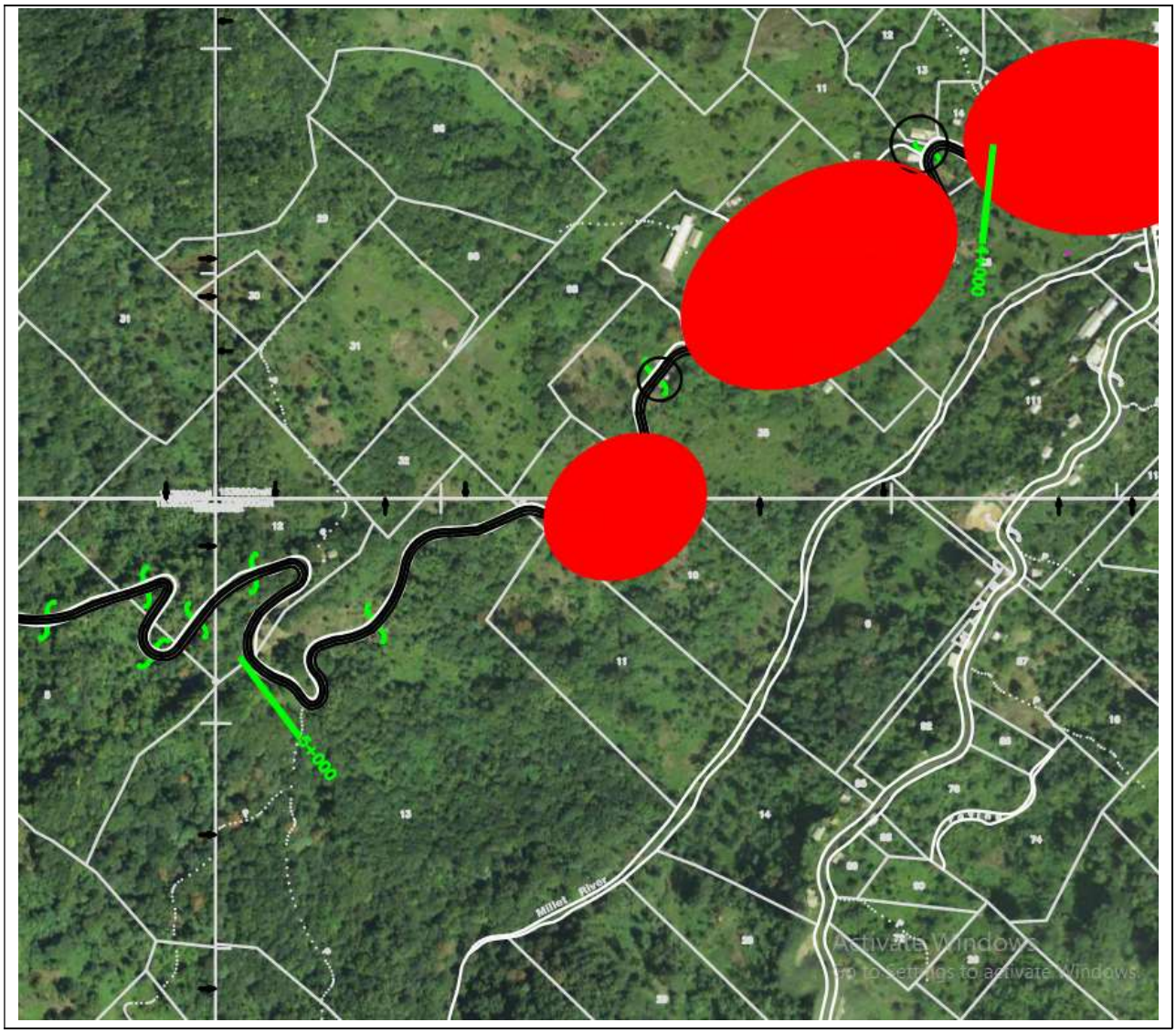


Figure 5913 Zone A (human impact) receptors between chainage 4 km and 5 km classified as Zone 3 in severity.

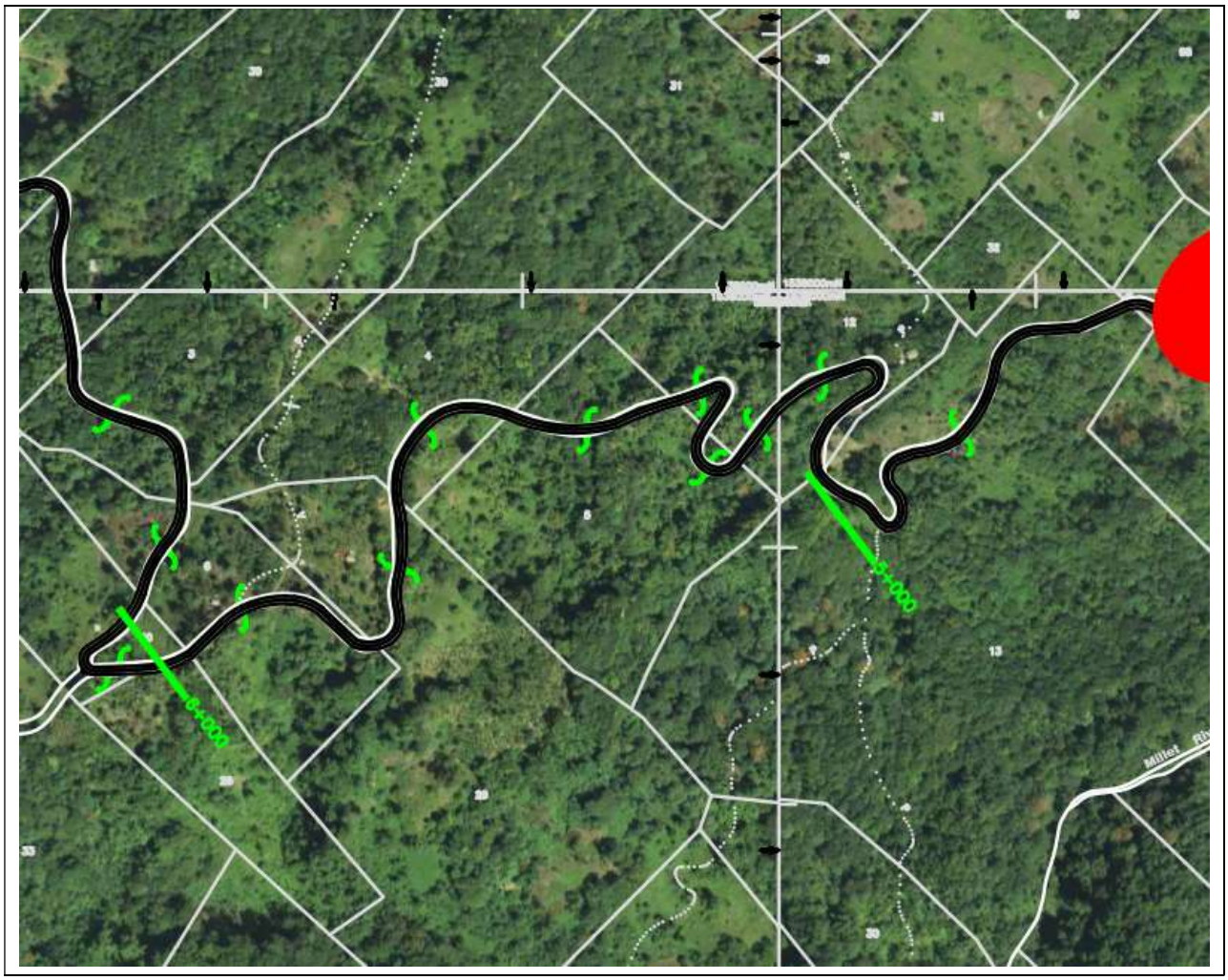


Figure 60 Reduced Zone A (human impact) receptors between chainage 5 km and 6 km.

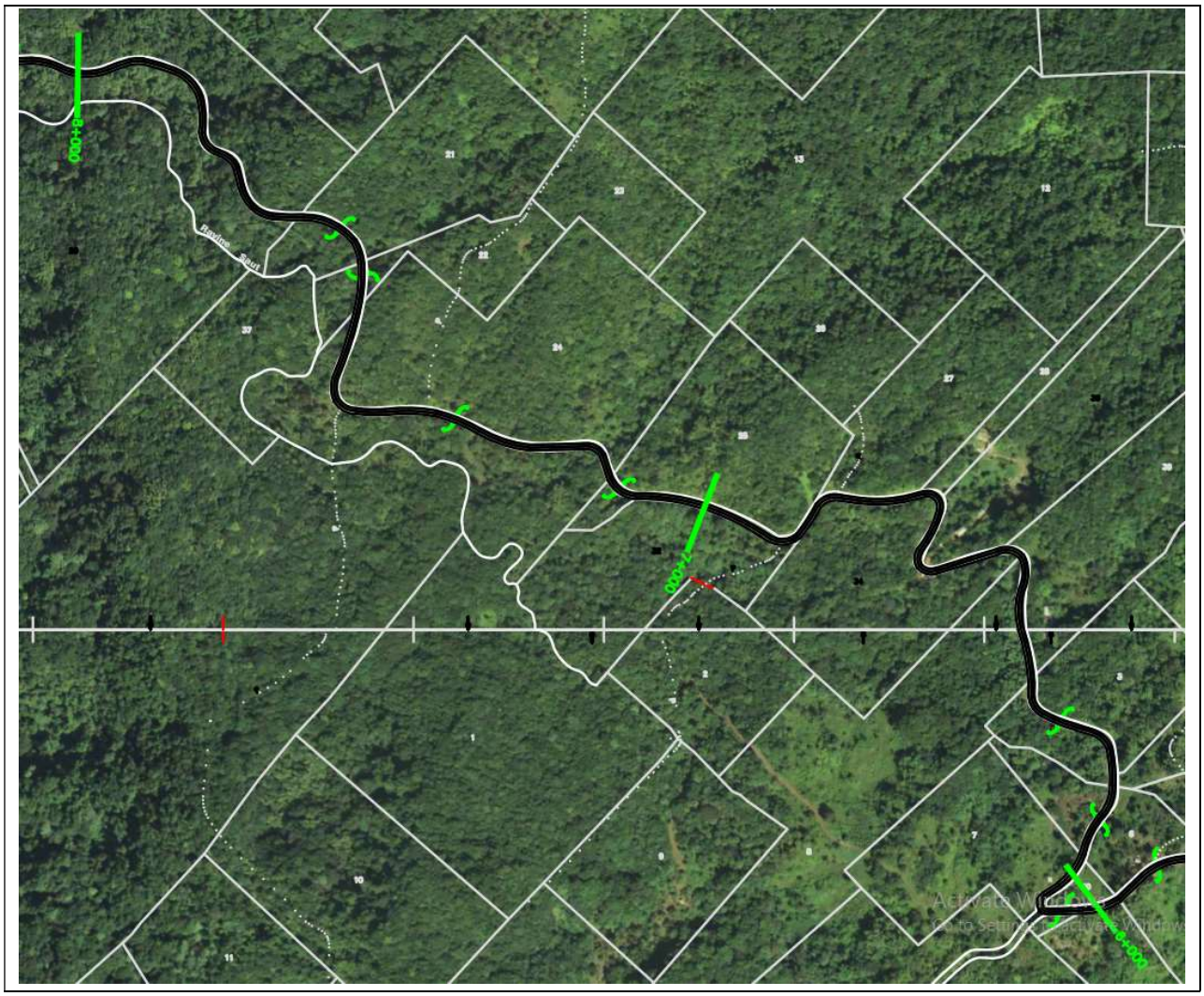


Figure 141 Reduced Zone A (human impact) receptors between chainage 6 km and 8 km.

Figure 152 Zone A with reduced receptors between chainage 6 km and 10 km.

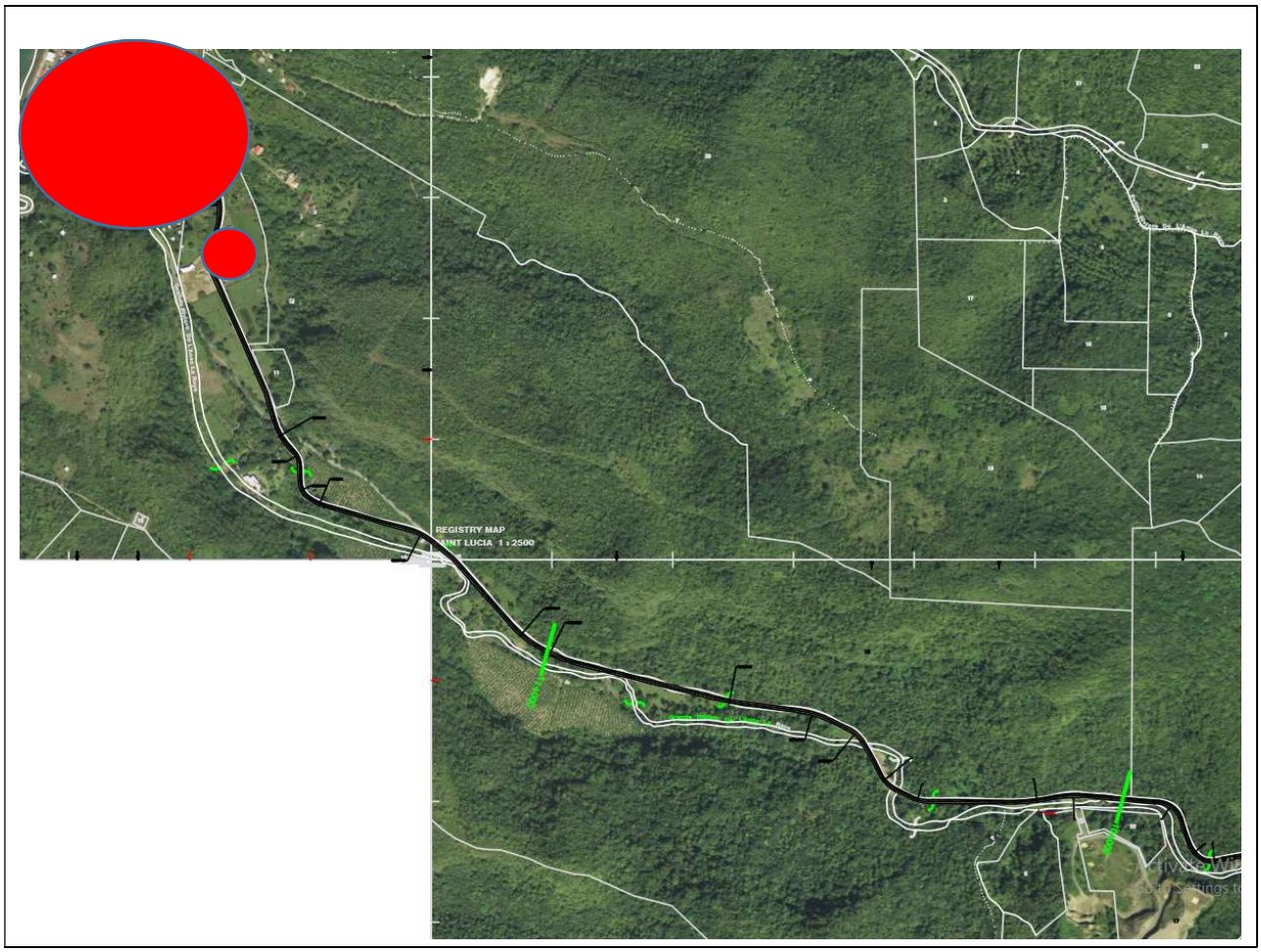


Figure 163 Zone A (human impact) receptors between chainage 10 km to 12 km (Anse La Raye Village) classified as Zone 3.

SECTION 9

ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN

9.0 Environmental Management Plan/Monitoring/Emergency Response Plan

This section discusses the management plan for mitigation/abatement and monitoring of adverse environmental impacts and enhancement of beneficial impacts due to the proposed road project. This plan is considered the main instrument by which the effectiveness of the environmental and social impact mitigative measures can be measured, and their effectiveness determined over the life of the project. The mitigative measures are based on best management practice and industry standards and responses from the communities and stakeholders.These are the mitigation measures which the selected contractor is expected to guided by and implement to ensure environmental protection during the execution of the works.

Table 22 below provides the potential impacts determined and the mitigative measures to address these impacts. Table 23 below follows from this table and lists the measures of the environmental and social management plan which are to be implemented and monitored. Specific clauses will also be attached to the works contract to assist in ensuring compliance.

The contractor must ensure that throughout the project works from the beginning to the end, that they do not adversely affected the natural environment by their activities. These activities would also include mobilization as well as demobilization. The final result must be a completed project that has implemented measures that allows it to function within the exiting environment over the long term after completion.

9.1 Impact Table of Predicted Impacts and Mitgative Measures for ESMP

Stemming from the potential impacts identified through the ESIA process, the following measures are presented to address those impacts and to feed into the Environmental and Social Management plan. These measures and impacts are presented in the table 23 below for the construction and operation phase of the project. Additional measurers may be added to ensure comprehensiveness.

Table 23. Predicted Impacts and Mitgative Measures Table

	Predicted Impacts	**Proposed Mitigative Measures**
1	Land take for work areas and auxiliary infrastructure	• Arrangements to be made prior to the commencement of works with landowners and or occupiers directly affected by the requirement for lands to facilitate project related activities. This is to be consistent with OP 4.12/ESF, and with OP4.12/ESS5 (Land Acquisition, Restrictions on Land Use and Involuntary Resettlement) in cases where the land is occupied by persons with no recognizable legal right or claim to the land, but are occupying it prior to the beginning of the project survey.
2	Loss of land cover/vegetation	• Prior to the commencement of works the Department of Forestry or a qualified botanist must be engaged to assist in the identification and marking of any key treed or vegetative areas that may need to be preserved, especially rear endemic species • Restrict vegetation clearing to carriage way, shoulders and drain in forest area • Minimize any vegetation clearance so as to safeguard this biodiversity and enhance its eco tourism appeal and visual impact following the completion of the project. • Utilize extensive pruning of overhanging vegetation and engage in total cutting or felling of trees as a last resort • Wherever possible, vegetation surrounding the road corridor should be kept as a buffer for wildlife, to reduce noise, and to act as a dust trap. • As part of any replanting exercise along the road, indigenous and fruit trees should be planted, or where present, retained for the benefit of humans and wildlife alike. • Maintain large trees within the area as best as possible • Ensure involvement of Department of Forestry in enumeration of any losses within the forest section in particular • Maintain deep rooted vegetation in areas where slopes and soils appear unstable and the potential for land slippage is high. This is especially so in higher elevations along the road.

		• Areas with very steep slopes should be avoided and remain under forest cover where possible to minimize soil exposure and provide habitat for wildlife. • During Operation stage of the project the DIPE Maintenance Department would have to ensure The DIPE must have a maintenance program that allow for selective trimming of overhanging vegetation. • No excessive clearing should be undertaken. • Where necessary the Forestry Dept should be engaged to ensure endemic are not destroyed • During the operational stage of the project, the removal of vegetation must be limited as far as possible to nuisance shrubbery.
3	Change in fauna species population, abundance, distribution	• Prior to the commencement of works the Department of Forestry or a qualified botanist must be engaged to assist in the identification and marking of any key habitat areas that may need to be preserved, especially rear endemic species • Avoid introduction of barriers to movement by placement of appropriate animal crossings; including culverts& road crossings for reptiles • Look out for nesting sites including trees to ensure young have hatched prior to vegetation clearing • Restrict vegetation clearance within the forested section • Ensure measures are in place to prevent workers brining in cats, dogs and other potential predator pets during operation phase. • Careful inspection and when necessary sainting of equipment brought into the site to prevent contamination and spread of pest, invasive and diseases. • Educate, inspect and where necessary sanitize workers' personal containers or any other item which can harbour known pest, diseases and invasive. • Implement proper waste management in line with existing national laws is paramount in reducing the impact of invasive species, pest and diseases which can impact the conservation of the biodiversity, specifically, the endangered species occurring in the project area. Therefore, waste produced during construction should be carefully managed and disposed according to guidelines established by the Solid Waste Management Authorities in Saint Lucia. • The site is within a snake habitat. Briefing sessions should be conducted with the Department of Forestry to educate and guide workers as to what species to watch out and to relocate. • Workers are not to hunt or harm any snakes, frogs, or other reptiles • Workers are to be educated that the Fer de lance snake is a legally protected species

		• Flushing exercises are to be conducted in lower vegetation and leaf litter to flush out any fauna prior and during the project construction exercises • Restrict vegetation clearing to carriage way, shoulders and drain in forest area • Minimize any vegetation clearance so as to safeguard this biodiversity and enhance its eco tourism appeal and visual impact following the completion of the project. • Utilize extensive pruning of overhanging vegetation and engage in total cutting or felling of trees as a last resort • Wherever possible, vegetation surrounding the road corridor should be kept as a buffer for wildlife, to reduce noise, and to act as a dust trap. • As part of any replanting exercise along the road, indigenous and fruit trees should be planted, or where present, retained for the benefit of humans and wildlife alike. • Maintain large trees within the area as best as possible • Ensure involvement of Department of Forestry in enumeration of any losses within the forest section in particular • Maintain deep rooted vegetation in areas where slopes and soils appear unstable • Areas with very steep slopes should be avoided and remain under forest cover where possible to minimize soil exposure and provide habitat for wildlife.
4	Waste Management & Contamination of soil or water courses	• Implement a Solid and Liquid waste management Plan • Vehicle repairs or service to be certified • Spill contingency plan should be in place to ensure minimal effects from any chemical spillage • Any fuel in storage must be stored within secondary containment & in accordance with the DIPE regulations • Provide adequate sanitation facilities • Temporary measures should be employed to control soil erosion during construction • Employ a SLSWMA licensed waste handler for transportation of hazardous waste Care to be taken during excavation; • Employ all necessary technical efforts along with monitoring to avoid face collapse at cracks and fissures during excavation and drilling activities • to prevent surface water contamination by oil/grease, leak proof containers shall be used for storage and transportation of oil/grease. • The floors of oil/grease handling area will be kept effectively impervious. • Any wash off from the oil/grease handling area or workshop will be drained through impervious drains, collected in

		specially constructed pit and treated appropriately before releasing for final discharge. • To prevent degradation and maintain the water quality during rainy season, adequate control measures should be adopted to check the contractor induced run-off into the natural water courses. • Wastewater from construction operations is expected to be treated before disposal. • Areas will be designated for the placement of any spoils or excavated overburden and topsoil and these will be cordoned off with silt curtains or geotextile to reduce any seepage and pollution of nearby river and water courses
5	Dust nuisance and exhaust emissions- Air Quality	• Employ dust suppression measures including wet excavations and road sprinkling • Regular sweeping of loose material accidentally dropped on paved roads • Conduct periodic air quality measurements, • Institute speed limits of 10-30kph within working area • Locate concrete mixing and material • Storage as far as is practically possible from buildings • ensure adequate size of vehicles are used for materials transport and covered • ensure construction vehicles are serviced on time • Control the dumping of materials from an optimum height (preferably not too high) so as to reduce blow. • All trucks entering or leaving the site with material must be covered with tarps for dust control and safety.
6	Noise Nuisance	• Conduct periodic noise measurements, institute speed limits of 10-30kph within the working area • Locate concrete mixing and material storage as far as is practically possible from buildings • restrict works to day time; at most till 7pm in populated area • Ensure provision of adequate PPE for workers • Prohibit onsite diesel trucks from idling in excess of five minutes • Require construction equipment that meets Tier 4 or exceeds Tier 2 standards and equip construction equipment with oxidation catalysts, particulate traps and demonstrate that these verified/certified technologies are available • Provide temporary traffic controls such as a flag person, during all phases of construction to maintain smooth traffic flow • To keep noise generation in control, latest sophisticated technology and equipment should be considered. • Drills, loaders, dumpers etc with larger capacities should be acquired to reduce the number of operational units at a time, thereby reducing the noise generating sources.

		• The equipment systems should include cabins to ensure that the operators and other work persons, in and around the operating equipment, have comfortable work stations. • Adopt innovative approaches of using improvised plant and machinery designs, with in-built mechanism to reduce sound emissions like improved silencers, mufflers and closed noise generating parts; • Procurement of drill, loaders and dumpers and other equipment with noise proof system in operator's cabin; • Confining the equipment with heavy noise emissions in soundproof cabins, so that noise is not transmitted to other areas; • Regular and proper maintenance of noise generating machinery including the transport vehicles • Design speeds around residential hotspots should be reduced to 40kph • Undertake noise monitoring
7	Impacts on community safety and health	• Maintain open communication with the community and have scheduled community meetings to update the community on key milestones in the project and solicit their feedback • Contractor to develop a community engagement plan • A project sign with all pertinent information such as the Client, project, consulting engineer, duration of project, contact numbers should be posted on site in a clearly visible area that can be discerned by the community. • A special grievance number must also be posted • Install traffic calming bumps to slow traffic down • Install marked pedestrian walkways and animal crossings where necessary to facilitate ease of movement • Install appropriate signage • Install bus laybys with seating to cater for elderly & vulnerable passengers if the roadway accommodates public transport • Ensure trained persons are in place to deter the public from the construction area and guide both project and non project traffic • Ensure adequate sensitization of community on safety and health hazards and place appropriate signage for hazard warnings • Ensure that mobile toilets are provided for the construction workforce • Have in place an HIV/AIDS & STI prevention campaign including all workers and surrounding community • Ensure that bitumen burning or hot asphalt mix is done at least 50m from residential or public establishments • Have in place a strict code of conduct for workers

		• Implement transparent redress measures in the event that any community member is adversely affected by the project activities • Ensure that workers are also sourced from the community to make up the work complement • Ensure that all workers not sourced from within the project area are accommodated within one work area • There must be no bias in selection of workers based on gender, sexual orientation, parental status, or any perceivable or implicit bias, • Ensure appropriate waste management plan is in place to effectively manage all waste • Ensure COVID 19 mitigative measures are implemented and practiced with any interaction with the community. These will include and not be limited to the wearing of face masks and shields, the washing or sanitizing with alcohol based sanitizers of hands for a minimum of 20 seconds, the practice of social distancing (keeping distance of 3 to 6 feet apart), the immediate seeking of medical assistance in the event that anyone is experiencing respiratory systems such as fever, coughing, shortness of breath, or sore throat by anyone who may interact with the community or the site.
8	Traffic Management/ Interruptions	• Implement a Traffic Management Plan • Ensure provision for appropriate communication & signage regarding road works • ensure that detours are well maintained prior to creation of road diversions • Work on half road, to permit road usage as much as is practically possible • Have trained flags persons in place to direct traffic • Have in place a documented traffic management plan for implementation
9	Grievances	• Clear communication protocol should be established and communicated to all community and local authorities • A project sign with all pertinent information such as the Client, project, consulting engineer, duration of project, contact numbers should be posted on site in a clearly visible area that can be discerned by the community. • A special grievance number must also be posted. • Roads committees should be established& maintained • Grievance records book should be placed at sub county or parish headquarters • Grievance procedures to be developed by contractor to address potential issues, including procedures to attend to gender based violence.
10	Loss of land cover at material source points, over	• Restore material source points by levelling and replanting vegetation • Obtain statutory approvals for extraction of any materials

	exploitation/degradation of source	
11	Slope Works, Soil erosion, and Stabilization	• All slope works must be supervised, and a record kept, by the site engineer. • The contractor must ensure that appropriate slope stabilization and erosion control measures such as but not limited to, benching, silt fences, etc are implemented. • Proper site drainage must be implemented • Any drain clogged by construction material or sediment must be unclogged as soon as possible to prevent overflow and flooding. • The use of retaining structures and planting with deep rooted grasses to retain soil during and after works especially along riverbanks must be undertaken. • The use of bio-engineering methods must be considered as a measure to reduce erosion and land slippage. • Keep angle of slopes within limits of soil type. • Balance cut and fill to limit steepness of slopes. • All slopes and excavated areas must be constantly monitored for movement. • All workers working on or around any slopes must be vigilant and be constantly supervised to for safety reasons to reduce the possibility of any injury or other accident as a result of slope movement or failure • There must be no work on slopes during wet or adverse weather. Work will resume after inspection by site engineers. • Geotextiled or silt curtains and silt traps should be used as a means of erosion/sediment control around the base of worked slopes at an appropriate distance to restrict the movement of loose or saturated soil and reduce the possibility of sediment travel and siltation across roads, drains, or in nearby water courses. • Loose material on slopes which slid in the past will be removed and sent to the Deglos Landfill • slopes will then be shaped to a stable angle of repose and subsequently grass will be planted on the surface.
12	Occupational Health and Safety incidents	• All activity on the site will be guided by the relevant legislation such as the Employees (Occupational Health and Safety) Act No 10 of 1985, Saint Lucia Labour Codes and the Health Act and Regulations. • A Health and Safety Plan will implemented and guide all worker safety requirements • Ensure provision of first aid kits in appropriate quantity and quality as required by the St Lucia labour laws.

		• Ensure provision of adequate training including worker inductions, periodic safety and health training • Establish, document and communicate incident reporting procedures • Ensure provision for appropriate eye wash stations • Ensure for provision of trained first aid administrators • Ensure provision of personal protective equipment to all persons involved in construction • Reducing the exposure time of workers to the higher noise levels by shift management. • Workers engaged at the strategic locations/dust generation points like drills, loading & unloading points, spreading etc., must be provided and wear dust masks. • Ensure daily provision of drinking water at the construction site and any workers' areas • Proper sanitary facilities must be provided by the project management so that employees do not suffer from any health ailments. The employees will be made aware of general sanitary practices • Training programmes to inform the employees about their task, associated risk, and safe working practices should be undertaken include information on accident prevention, proper control and maintenance of equipment and safe material handling practices. • Maintain records of job related accidents and illness should be maintained. Such information shall be reviewed and evaluated to improve the effectiveness of Environmental Health and Safety programme. • Implement a strict code of conduct for all workers • Absolutely no violence including gender based violence, drug abuse, alcoholism, social exclusion, or other determined negative behavior must be tolerated. The necessary measures must be put in place by the contractor to mitigate these and immediately exercise the necessary actions such as release of worker, involvement of law enforcement, or other necessary measures. • Absolutely no child labour is to be utilized. • The site is within a snake habitat for the poisonous Fer de lance and the Boa Constrictor snakes. Ensure The Department of Forestry is engaged to provide training in snake response and critical emergency procedures to ensure the safety of all workers. • The contractor prepare and implement a COVID 19 Management Plan that provides preventative measures consistent with the prescription of the National Covid 19 Management initiatives undertaken by the Government under the guideance of the Chief Medical Officer, Ministry of Health and Wellness, WHO, and all pertinent organizations to ensure worker and community safety. These measures

		must include the continued sensitization of Covid 19 measures at daily morning briefings, the wearing of masks, the availability and use of hand washing stations with soap and water, the regular disinfection of all work toilet areas, the provision and use of hand sanitizers, social distancing, the immediate identification of forwarding of any persons displaying any Covid 19 associated symptoms from the site to a medical facility. • Contractor to be familiar with WHO and PAHO Covid-19 Guidelines to ensure safety of the project site during the duration of the project. • Ensure that all foreign workers from outside of the country are quarantined within residences or facilities approved by the Ministry of Health and for the required quarantine period. • A regular monitoring of the Occupational Health and Safety requirements will reduce the chances of accidents and conflict along the roadway
13	Fire & Emergency incidents	• Removal of all slash material from ROW • Provide adequate fire-fighting gear for any work area especially where workers congregate and proper housekeeping • Ensure asphalt heating is undertaken by qualified personnel and away from community reach • Train workers on how to respond in case of fire & other emergencies • The contact numbers for all emergency services and nearby medical facilities must be readily available to all staff.
14	Security incidents	• Ensure storage areas are guarded with appropriate controls and security personnel • Security personal are to be present overnight and when there is no work activity occurring on site such as on holidays or weekends as determined by the contractor and client. • All workers to be protected by the onsite security • Restrict entrance to storage areas and workers areas to authorized persons • Have in place appropriate identification for staff and casual workers • Have in place an emergency response plan and communicate procedures to all construction crew • Ensure recruitment is through local authorities
15	Impacts from drainage and culvert works	• Ensure all drainage construction is supervised by a qualified engineer • Design of cross drains and outfalls to be informed by hydrological studies • Undertake construction according to the recommended design that has been revied by the project and consulting engineers

		• Install sediment control measures such as geotextile and sediment curtains to reduce the incidence of sedimentation from associated works on drains and culvert construction on existing drains and water courses • Install outfall protection measures such as rip-rap to reduce the impact of any directed flow of water • Traffic control measures must be implemented during all culvert and drain works to ensure minimization of negative impacts on existing motor and pedestrian traffic. These include signage and dedicated personnel to direct traffic flows. Use of lined concrete drains where required or agreed by Client. • Construct energy dissipators along steep drain sections (slope greater than 10%) • Construct lined culvert outfalls with energy dissipators. • Construct silt traps at the end of culvert outfalls • Shape slopes along culvert outfalls to stable angles of repose and plant grass on the surface. • The DIPE must ensure a maintenance program that provides for the monitoring of all drains and culverts and road surface to allow for quick remediation and ensuring longevity of the infrastructure
16	Quarries and borrow areas	• All due diligence is to be undertaken if a private quarry is proposed to be utilized for source material to ensure they are reputable, licensed and not contributing to any environmental pollution • Material is to be sourced from a Government legislated operation to ensure that the source material and the manner in which it was produced along with the resulting quality is to the standard required by the project for use. • There will be no use of overgrown or existing disused quarries within the project limits • There will be no creation of any new quarries or borrow pits will be opened, • All haul trucks travelling to and from the approved quarry sites will have the material covered with tarps to prevent possible spillage and fly stones. • All hauled material will be dumped in designated storage areas on site
17	Permits and Approvals	• The contractor and consulting engineer must ensure that all the required permits and approvals are in place to facilitate the construction. • If materials are to be sourced from external sources or “associated facilities” such as adjacent quarries or block making plants, the contactor must ensure that that operation is an approved, legally operating establishment

18	Cultural and Chance Finds/ destruction	• The contractor to develop a Chance / Cultural Heritage find plan. Procedures within the plan will include the following: • Upon the discovery, unearthing, or damage of what may be assumed to be an artifact, all work within the area must stop and equipment removed immediately. • The site must eb cordoned off immediately and no om=ne must be allowed to enter except management • The contractor is to contact the client and the relevant authorities which are the Saint Lucia Archaeological Society and the Saint Lucia National Trust are to be contacted. • The contractor is to work with the client and facilitate the necessary preservation, onsite investigative process, and removal of artifact or find. • Work will only resume following the provision of approval to contractor by the client following consultation with the relevant authorities. • The contractor to implement certain monitoring and response conditions stipulated by the relevant authorities after the chance find if necessary following consultation with the client.

These measures are to be included in the ESMP to ensure any potential impacts are adequately addressed. The contractor and supervising consultant are to ensure that there are no impediments to the effective implementation of these measures throughout the project. **The mitigative measures will form part of the contract requirements for the contractor**. Specific guidelines that refer such areas as labour management, COVID 19 measures, and stakeholder engagement would also be applicable and are expected to be implemented by the contractor.

In addition to these measures, recommendations from the various studies are to be included and guide the ESMP as well. It must be noted that **all workers and visitors, including suppliers entering the work site will be subjected to the stipulations of the ESMP and particularly the Occupational Health and Safety Plan**.

9.3 Managing the ESMP

The ESMP will contain the following elements to assist in ensuring implementation and effective monitoring. The ESMP is presented as table 24 below.

- The **proposed or predicted impacts** to identify what might occur during the phases of the project
- The **proposed mitigative measures** to identify the management measures to be implemented

- The **Indicators for mitigation** which is the measurable indicator to determine how close the measures are to the acceptable targets set
- The determined **Target** that indicates what level or measures is to be achieved that may not be exceeded to ensure safety measures,
- The **Baseline value** that indicted whether or not the measures are acceptable or are achieving the target,
- The **Implementer or stakeholder** who is the designated person to ensure the required measures are being implemented
- The **period/schedule or in works/ timing** that indicates when or within what phase of the works that the particular measures are to be implemented
- The **Monitoring agency** who will be responsible for monitoring to ensure that particular sector related mitigation measures are being implemented
- The **Timing for monitoring** which is when or the frequency that the individual or responsible agency is scheduled to visit over time

9.4 Budgeting

Budgeting for the monitoring and management of the ESMP will need to be defined during the preconstruction phase so that adequate resources can be allocated to allow for a consistent effort through out the life of the project.

9.5 Training

It is expected that the contractor will be involved in facilitating the necessary training for specific staff in the specific environmental and health and safety practices that would be required to successfully and consistently implement the required measures within the ESMP.

9.6 Supervision, Monitoring, and Reporting of the ESMP

It must be noted that **all workers and other persons including suppliers entering the work site will be subjected to the stipulations of the ESMP and particularly the Occupational Health and Safety Plan**.

A unified and integrated approach must be adopted in reviewing and monitoring the projects from pre-construction to operations in order to respond to any issue that may arise. The purpose of the ESMP and its conditions reflected in the construction and operational contract are to ensure accepted good practices are employed and maintained in order to mitigate any adverse environmental and social impacts.

The contractor, his staff, and the supervising consultant will work collaboratively to ensure the components of the plan are being implemented to ensure all safety and there is compliance with the contractual clauses.

While the contractor will be monitoring on a daily basis, the PCU may also inspect on a semi regular basis to ensure that the World Bank's requirements are being met. Such visits may be with the DIPE. Additionally, statutory agencies who are guided by their specific legal responsibilities may visit as part of their routine monitoring, or respond to specific issues or red flags that may occur because of a specific incident. Such agencies may be the Physical Planning Department/ Development Control Authority, the Ministry of Health and Wellness, the Ministry of Agriculture through its extension officers, or even the Saint Lucia Fire Service or the Saint Lucia Police Force called for specific occurrences.

9.7 Additional Plans, Permits, and Management Guidelines

Additional plans will be required to support the ESMP. These plans will include, but may not be limited to a **Contractor's ESMP (CESMP)** which will contain all of the mitigative measures determined within the ESIA; a Storm Water Runoff Prevention Plan that will detail the measures to be implemented to prevent turbidity, siltation, and sedimentation from leaving the work site and polluting the adjacent water courses; and an , **Occupational Health and Safety plan** that will describe the required measures to ensure a healthy and safe working environment,

Along with plans, the contractor and consulting engineer will have to ensure that any requisite **approvals or permits** such as Planning or Health Approvals have been obtained to facilitate the proposed project activities. Materials such as concrete blocks or quarry related base materials will be required and the most economical means to source these will be considered. This may mean the sourcing of materials from sources such as the existing quarries in Venus. These facilities would be considered as **associated facilities**. There will be the need for the contractor to undertake the necessary due diligence as highlighted in

section 5.11 earlier to ensure that these facilities are not contributing to pollution of the adjacent riverine system. The contractor will need to ensure that while there is material is sourced from an approved Government regulated operation to ensure that the source material and produced in a manner and the resulting quality is to the standard required by the project.

The contractor is expected to develop and implement **specific guidelines** for such areas as labour management, COVID 19 measures, and stakeholder engagement would also be applicable. These must complement the ESMP to ensure a safe working environment and fruitful project. The World Bank provides guidelines that can be used, or assist in the preparation the necessary environmental and social protocols and procedures such as the **labor management procedures (LMP) plan**. **COVID 19 site management protocols** reflecting measures to be implemented to ensure safety within as well as on leaving the site are reflected in Appendix 9. Additional measures and recommendations aimed at limiting the risk and preventing the spread of COVID-19 for construction sites may be obtained from the Pan American Health Organization (PAHO).[7] Guidelines for **stakeholder engagement** may be found on the Bank's web site as a source of information for guidance. [8] Procedures for **chance or antiquity discovery** during the execution of the project works are reflected within Appendix 10.

[7] PAHO and UNOPS recently published a document that outlining measures and recommendations aimed at limiting the risk and preventing the spread of COVID-19 for construction sites. This guide can be obtained from the PAHO websites: https://www.paho.org/en/documents/covid-19-prevention-measures-construction-sites-prevention-measures-managing-covid-19 and site https://iris.paho.org/handle/10665.2/52217

[8] The World Bank's Environmental and Social standards and guidelines on these areas such as labour management, and Stakeholder engagement &Information disclosure amongst others for the project may be found on their website https://www.worldbank.org/en/projects-operations/environmental-and-social-framework/brief/environmental-and-social-standards

9.8 Monitoring Plan –Environmental and Social Management Plan

Table 24 SUMMARY: ENVIORMRNTAL & SOCIAL MONITORING PLAN

Environmental and Social Management Plan

Key activities under each phase	Predicted Impacts	Proposed Mitigation measures	Indicators for mitigation	Target	Baseline value	Implementer/ stakeholder	Period/schedule in works/ timing	Monitoring agency	Timing for monitoring
	Land take for any work areas and auxiliary infrastructure	Formal lease agreements with the landowners prior to the construction of any work areas or storage areas	Tenure agreements	Tenure agreement for each area of land being utilised Absence of conflict	No land has been allocated for contractor or work areas	Contractor	Mobilization	Supervising Consultant	Monthly during mobilization

Construction Phase	Loss of land cover /vegetation	Plant indigenous trees within the right of way Ensure involvement of Department of Forestry in enumeration of any losses within the forest section in particular Restrict vegetation clearing to carriage way, shoulders and drain in forest area Prior to the commencement of works the Department of Forestry or a qualified botanist must be engaged to assist in the identification and marking of any key treed or vegetative areas that may need to be preserved, especially rear endemic species. Restrict vegetation clearing to carriage way, shoulders and drain in forest area. Minimize any vegetation clearance so as to safeguard this biodiversity and enhance its eco tourism appeal and visual impact following the completion of the project. Utilize extensive pruning of overhanging vegetation and engage in total cutting or felling of trees as a last resort Wherever possible, vegetation surrounding the road corridor should be kept as a buffer for wildlife, to reduce noise, and to act as a dust trap. As part of any replanting exercise along the road, indigenous and fruit trees should be planted, or where present, retained for the benefit of humans and wildlife alike. Maintain large trees within the area as best as possible Ensure involvement of Department of Forestry in enumeration of any losses within the forest section in particular Maintain deep rooted vegetation in areas where slopes and soils appear unstable and the potential for land slippage is high. This is especially so in higher elevations along the road. Areas with very steep slopes should be avoided and remain under forest cover where possible to minimize soil exposure and provide habitat for wildlife.	Area cleared Size of area planted Department of Forestry clearances	No more than 3m from the centre line should be cleared	All area other than existing carriage way is covered in vegetation	Contractor	Civil works	Supervising Consultant DIPE DOF	Weekly during site clearing 6 months prior to pre-commission ing
	Change in fauna species population, abundance, distribution	Prior to the commencement of works the Department of Forestry or a qualified botanist must be engaged to assist in the identification and marking of any key habitat areas that may need to be preserved, especially rear endemic species. Avoid introduction of barriers to movement by placement of appropriate animal crossings; including culverts& road crossings for reptiles	Presence of crossings at forested areas Number of nesting sites disturbed	Crossings present in forest No more than 8m width of vegetated area within the	Crossings are present	Contractor	Civil works	Supervising Consultant DIPE DOF	Design review stage Weekly during site clearing

Change in fauna species population, abundance, distribution	Look out for nesting sites including trees to ensure young have hatched prior to vegetation clearing. Restrict vegetation clearance within the forested section. Ensure measures are in place to prevent workers brining in cats, dogs and other potential predator pets during operation phase. Undertake careful inspection and when necessary sainting of equipment brought into the site to prevent contamination and spread of pest, invasive and diseases. Educate, inspect and where necessary sanitize workers' personal containers or any other item which can harbour known pest, diseases and invasive. Implement proper waste management in line with existing national laws is paramount in reducing the impact of invasive species, pest and diseases which can impact the conservation of the biodiversity, specifically, the endangered species occurring in the project area. Therefore, waste produced during construction should be carefully managed and disposed according to guidelines established by the Solid Waste Management Authorities in Saint Lucia. The site is within a snake habitat. Briefing sessions should be conducted with the Department of Forestry to educate and guide workers as to what species to watch out and to relocate. Workers are not to hunt or harm any snakes, frogs, or other reptiles Workers are to be educated that the Fer de lance snake is a legally protected species Flushing exercises are to be conducted in lower vegetation and leaf litter to flush out any fauna prior and during the project construction exercises. Restrict vegetation clearing to carriage way, shoulders and drain in forest area Minimize any vegetation clearance so as to safeguard this biodiversity and enhance its eco tourism appeal and visual impact following the completion of the project. Utilize extensive pruning of overhanging vegetation and engage in total cutting or felling of trees as a last resort Wherever possible, vegetation surrounding the road corridor should be kept as a buffer for wildlife, to reduce noise, and to act as a dust trap. As part of any replanting exercise along the road, indigenous and fruit trees should be planted, or where present, retained for the benefit of humans and wildlife alike. Maintain large trees within the area as best as possible Ensure involvement of Department of Forestry in enumeration of any losses within the forest section in							

Waste management and Contamination of soil or water courses	Implement a liquid and solid waste management plan All wastes to be properly stored and disposed of regularly off site to ensure build up is prohibited. All cut vegetation to be carted off site. Any large trees or suitable vegetation must be offered to local community to use for charcoal or fencing vehicle repairs or service to be certified Spill contingency plan should be in place to ensure minimal effects from any chemical spillage Any fuel in storage must be stored within secondary containment & in accordance with the DIPE regulations Provide adequate sanitation facilities Temporary measures should be employed to control soil erosion during construction Employ a SLSWMA licensed waste handler for transportation of hazardous waste Efforts to avoid face collapse at cracks and fissures during excavation and drilling activities To prevent surface water contamination by oil/grease, leak proof containers shall be used for storage and transportation of oil/grease. The floors of oil/grease handling area will be kept effectively impervious. Any wash off from the oil/grease handling area or workshop will be drained through impervious drains, collected in specially constructed pit and treated appropriately before releasing for final discharge. To prevent degradation and maintain the water quality during rainy season, adequate control measures should be adopted to check the contractor induced run-off into the natural water courses. Wastewater from construction operations is expected to be treated before disposal. Areas will be designated for the placement of any spoils or excavated overburden and topsoil and these will be cordoned off with silt curtains or geotextile to reduce any seepage and pollution of nearby river and water courses	designated service stations Oil or chemical spills Inventory of fuel or chemicals in storage Number of fuel storage areas Petroleum storage permits Erosion control structures % of soil reused in fill operations	No pollution of soil, surface or ground water	No contamination of water sources	Contractor	Throughout construction phase	Supervising Consultant DIPE DEH	Monthly
Waste management and Contamination of soil or water courses	Wastewater from construction operations is expected to be treated before disposal. Areas will be designated for the placement of any spoils or excavated overburden and topsoil and these will be cordoned off with silt curtains or geotextile to reduce any seepage and pollution of nearby river and water courses							
Dust nuisance and exhaust emissions	Employ dust suppression measures including wet excavations and road sprinkling. conduct periodic air quality measurements, Institute speed limits of 10-30kph within working area Locate concrete mixing and material storage as far as is practically possible from buildings. Ensure adequate size of vehicles are used for materials transport and covered ensure construction vehicles are serviced on time All trucks entering or leaving the site with material must be covered with tarps to ensure dust control and safety.	Number of water tankers per day wet earth works , Record of particulate matter measurements, evidence of speed limit signage location of material storage and mixers covers over sand and gravel in transportation	Compliance with draft air quality standards for St Lucia Daily dust suppression by sprinkler Weekly air quality reporting	Little or no disturbance to air quality	Contractor,	Weekly throughout construction phase	Supervising Consultant DIPE DEH	Monthly

Noise nuisance	Conduct periodic noise measurements, institute speed limits of 10-30kph within working area locate concrete mixing and material storage as far as is practically possible from buildings	Record of noise measurements, measurements, evidence of speed limit signage location of material	Compliance with National Environment Standards	Sound pressure level values of 30-70 dB(A) recorded in project area	Contractor,	Weekly LEQ measurements throughout construction phase	Supervising Consultant DIPE DEH	Monthly

Key activities under each phase	Predicted Impacts	Proposed Mitigation measures	Indicators for mitigation	Target	Baseline value	Implementer/ stakeholder	Period/schedule in works/ timing	Monitoring agency	Timing for monitoring
	Noise nuisance	Restrict works to day time; at most till 7pm in populated area Ensure provision of adequate PPE for workers Prohibit onsite diesel trucks from idling in excess of five minutes Require construction equipment that meets Tier 4 or exceeds Tier 2 standards and equip construction equipment with oxidation catalysts, particulate traps and demonstrate that these verified/certified technologies are available Provide temporary traffic controls such as a flag person, during all phases of construction to maintain smooth traffic flow To keep noise generation in control, latest sophisticated technology and equipment should be considered. Drills, loaders, dumpers etc with larger capacities should be acquired to reduce the number of operational units at a time, thereby reducing the noise generating sources. The equipment systems should include cabins to ensure that the operators and other work persons, in and around the operating equipment, have comfortable work stations. Adopt innovative approaches of using improvised plant and machinery designs, with in-built mechanism to reduce sound emissions like improved silencers, mufflers and closed noise generating parts; Procurement of drill, loaders and dumpers and other equipment with noise proof system in operator's cabin; Confining the equipment with heavy noise emissions in soundproof cabins, so that noise is not transmitted to other areas; Regular and proper maintenance of noise generating machinery including the transport vehicles	storage and mixers observed working hours workers with ear plugs or muffs						

Impacts on community safety and health	Ensure trained persons are in place to deter the public from the construction area Maintain open communication with the community and have scheduled community meetings to update the community on key milestones in the project and solicit their feedback Contractor to develop a community engagement plan A project sign with all pertinent information such as the Client, project, consulting engineer, duration of project, contact numbers should be posted on site in a clearly visible area that can be discerned by the community. A special grievance number must also be posted Install traffic calming bumps to slow traffic down Install marked pedestrian walkways and animal crossings where necessary to facilitate ease of movement Install appropriate signage Ensure adequate sensitization of community on safety and health hazards Have in place appropriate signage for hazard warnings Ensure that mobile toilets are provided for the construction workforce. Have in place an HIV/AIDS & STI prevention campaign including all workers and surrounding community. Ensure that bitumen burning or hot asphalt mix is done at least 50m from residential or public establishments Have in place a strict code of conduct for workers Ensure that all workers not sourced from within the project area are accommodated within one work area. Ensure appropriate waste management plan is in place to effectively manage all waste. Ensure COVID 19 mitigative measures are implemented and practice with any interaction with the community. These will include and not be limited to the wearing of face masks, the washing or sanitizing of hands for a minimum of 20 seconds, the practice of social distancing, the immediate seeking of medical assistance in the event that anyone is experiencing respiratory systems such as fever, coughing, shortness of breath, or sore throat by anyone who may interact with the community or the site.	Presence of security & liaison personnel Number of meetings or announcements Signage in place Presence of mobile toilets Attendance lists for workers and community Posters on display Location of processing area Documented worker code of conduct for any workers' area Implemented and document waste plan	Zero incidents involving community members HIV/STI voluntary testing once every three months Toilet available within 200m of working area Compliance to National environment regulations & Effluent discharge regulations	No incidents	contractor	Throughout construction period	Supervising Consultant DIPE DEH	Monthly
Traffic Management/ Interruption	Ensure provision for appropriate communication & signage regarding road works ensure that detours are well maintained prior to creation of road diversions Work on half road, to permit road usage as much as is practically possible Have trained flags persons in place to direct traffic Have in place a documented traffic management plan for implementation	Presence of appropriate signage along connecting roads Community complaints Flags persons Presence of traffic management plan	Zero incidents	No incidents	Contractor	Daily Throughout construction period	Supervising Consultant DIPE	Monthly
Grievances	Clear communication protocol should be established and communicated to all community and local authorities A project sign with all pertinent information such as the Client, project, consulting engineer, duration of project, contact numbers should be posted on site in a clearly visible area that can be discerned by the community. Roads committees should be established & maintained Grievance records book should be placed at sub county or parish headquarters Grievance procedures to be developed by contractor to address potential issues, including procedures to attend to gender based violence. A grievance register must be kept on site and all issues recorded there in. Greivance remediation is the responsibility of the PCU, but the contractor, Client, and PCU must work together to address grievances.	Understood communication procedure Presence of roads committee Presence of grievance records	Knowledge of all stakeholder grievances Timely resolution of all stakeholder grievances	No grievances No DIPE road committee	DIPE	During mobilization phase prior to commencement of construction And monthly reviews	PCU SLSWMA District local government	Monthly during construction phase

Loss of land cover at material source points, over exploitation/degradation of source points, increased vector breeding sites	Restore material source points by levelling and replanting vegetation Obtain the necessary statutory approvals for extraction of materials	Number of acres planted , permits for burrow pits, status of burrow pits, permits for ground water abstraction prevalence of malaria	Levelled and fully restored material source points	Majority of material source points are pre- existing burrow pits	Contractor	Monthly throughout construction phase	Supervising Consultant, SLSWMA District Environment Officer	Monthly during construction phase

Key activities under each phase	Predicted Impacts	Proposed Mitigation measures	Indicators for mitigation	Target	Baseline value	Implementer/ stakeholder	Period/schedule in works/ timing	Monitoring agency	Timing for monitoring
	Slope Works, Soil Erosion and Slope Stabilization	All slope works must be supervised, and a record kept, by the site engineer. The contractor must ensure that appropriate erosion control measures such as silt fences are installed. Proper site drainage must be implemented Any drain clogged by construction material or sediment must be unclogged as soon as possible to prevent overflow and flooding. The use of retaining structures and planting with deep rooted grasses to retain soil during and after works especially along the riverbanks must be undertaken. The use of bio-engineering methods must be considered as a measure to reduce erosion and land slippage. Keep angle of slopes within limits of soil type. Balance cut and fill to limit steepness of slopes. All slopes and excavated areas must be monitored for movement. All workers working on or around any slopes must be vigilant and be constantly supervised to for safety reasons to reduce the possibility of any injury or other accident as a result of slope movement or failure There must be no work on slopes during wet or adverse weather. Work will resume after inspection by site engineers. Geotextiled or silt curtains and silt traps should be used as a means of sediment control around the base of worked slopes at an appropriate distance to restrict the movement of loose or saturated soil and reduce the possibility of sediment travel and siltation across roads, drains, or in nearby water courses. Loose material on slopes which slid in the past will be removed and sent to the Deglos Landfill slopes will then be shaped to a stable	Number of incidences of land slides No of slope related accidents	Zero occurrence of land slides, failures,or soil slippage Zero or minimal sedimentation of any watercourse Zero accidents from working on slopes	Zero earth movement	Contractor	Throughout construction period	Supervising Consultant DIPE	Daily

Construction phase	Occupational safety and health incidents	. All activity on the site will be guided by the relevant legislation such as the Employees (Occupational Health and Safety) Act No 10 of 1985, Saint Lucia Labour Codes, and the Health Act and Regulations A Health and Safety Plan to be implemented and guide all worker safety requirements Ensure provision of first aid kits in appropriate quantity and quality as required by the St Lucia labour laws Ensure provision of adequate training including worker inductions, periodic safety and health training Establish, document and communicate incident reporting procedures Ensure provision for appropriate eye wash stations Ensure for provision of trained first aid administrators Ensure provision of personal protective equipment to all persons involved in construction The contact numbers for all emergency services and nearby medical facilities must be readily available to all staff. Ensure daily provision of drinking water at the construction site & workers areas Implement a strict code of conduct for all workers Absolutely no violence including gender based violence, drug abuse, alcoholism, social exclusion, or other determined negative behavior must be tolerated. The necessary measures must be put in place by the contractor to mitigate these and immediately exercise the necessary actions such as release of worker, involvement of law enforcement, or other necessary measures. Absolutely no child labour to be utilized. The site is within a snake habitat for the poisonous Fer de lance and the Boa Constrictor snakes. Ensure The Department of Forestry is engaged to provide training in snake response and critical emergency procedures to ensure the safety of all workers. The contractor prepare and implement a COVID 19 Management Plan that provides preventative measures	Number of first aid kits Contents of first aid kits Number of workers inducted versus total number of workforce Training attendance lists Workers knowledge Presence of trained first aid personnel Documented incident reporting procedure and incident reports Pre-employment medical exam record Presence of drinking water Presence of dedicated clinic	At least one kit for every working area Zero accidents Daily tool box talks Orientation or induction training for workers Periodic training at least once a month Full PPE for all construction crew & supervisors Timely incident reports	Zero accidents Zero impact to health of employees	Contractor	Throughout construction period	Supervising Consultant DIPE DEH	Weekly Monthly throughout construction
	Fire & emergency incidents	Removal of all slash material from ROW Provision of adequate fire-fighting gear for workers' areas and proper housekeeping Ensure asphalt heating is undertaken by qualified personnel and away from community reach Train workers on how to respond in case of fire & other emergency The contact numbers for all emergency services and nearby medical facilities must be readily available to all staff.	Record of incidents Presence of fire readiness plans Worker's knowledge of emergency procedures	Zero incidents	No fires recorded	Contractor	Throughout construction period	Supervising Consultant	Monthly
	Security Incidents	Ensure storage areas are guarded with appropriate controls and security personnel Security personal are to be present overnight and when there is no work activity occurring on site such as on holidays or weekends as determined by the contractor and client All workers to be protected by the onsite security Restrict entrance to storage areas and workers' areas to authorized persons Have in place appropriate identification for staff and casual workers Have in place an emergency response plan and communicate procedures to all construction crew Ensure recruitment is through local authorities	Number of thefts reported Security Incidents reported ID cards for workers Entrance and exit controls at work areas	Zero incidents	No fuel depot in project area	Contractor	Throughout construction period	Supervising Consultant	Weekly

Drainage and Culvert works	Ensure all drainage construction is supervised by a qualified engineer Design of cross drains and outfalls to be informed by hydrological studies Undertake construction according to the recommended design that has been revied by the project and consulting engineers Install sediment control measures such as geotextile and sediment curtains to reduce the incidence of sedimentation from associated works on drains and culvert construction on existing drains and water courses Install outfall protection measures such as rip-rap to reduce the impact of any directed flow of water Traffic control measures must be implemented during all culvert and drain works to ensure minimization of negative impacts on existing motor and pedestrian traffic. These include signage and dedicated personnel to direct traffic flows. Use of lined concrete drains where required or agreed by Client. Construct energy dissipators along steep drain sections (slope greater than 10%) Construct lined culvert outfalls with energy dissipators. Construct silt traps at the end of culvert outfalls Shape slopes along culvert outfalls to stable angles of repose and plant grass on the surface.	No of drains clogged High siltation recorded within waterways Instances of Soil washed away and erosion below drains	Zero of drains clogged Low Level of sedimentation in waterways All soil areas protected	Al drains and culvert works and end products properly designed and constructed	contractor	throughout	Supervising Consultant	Through out duration
Quarries and Borrow Areas	All due diligence is to be undertaken if a private quarry is proposed to be utilized for source material to ensure they are reputable, licensed and not contributing to any environmental pollution Material is to be sourced from a Government legislated operation to ensure that the source material and the manner in which it was produced along with the resulting quality is to the standard required by the project for use. There will be no use of overgrown or existing disused quarries within the project limits There will be no creation of any new quarries or borrow pits will be opened, All haul trucks travelling to and from the approved quarry sites will have the material covered with tarps to prevent possible spillage and fly stones. All hauled material will be dumped in designated storage areas on site	Number of quarries with required approvals or permits utilized Number of new borrow pits or quarry areas created	All required permits and approvals obtained and in place	All approval / permit conditions met	Contractor	At beginning and then throughout construction period	Supervising Consultant DIPE	Throughout duration
Permits and Approvals	The contractor and consulting engineer must ensure that all the required permits and approvals are in place to facilitate the construction. If materials are to be sourced from external sources such as adjacent quarries or block making plants, the contactor must ensure that that operation is an approved, legally operating establishment	Number of required approvals or permits obtained	All required permits and approvals obtained and in place	All approval / permit conditions met	contractor	At beginning and then throughout construction period	Supervising Consultant DIPE	Throughout duration
Cultural and Chance Finds destruction	The contractor to develop and implement a Chance / Cultural Heritage find plan. Procedures within the plan will include the following: Upon the discovery, unearthing, or damage of what may be assumed to be an artifact, all work within the area must stop and equipment removed immediately. The site must eb cordoned off immediately and no om=ne must be allowed to enter except management The contractor is to contact the client and the relevant authorities which are the Saint Lucia Archaeological Society and the Saint Lucia National Trust are to be contacted. The contractor is to work with the client and facilitate the necessary preservation, onsite investigative process, and removal of artifact or find. Work will only resume following the provision of approval to contractor by the client following consultation with the relevant authorities. The contractor be implement certain conditions stipulated by the relevant authorities following consultation with the client.	Number of incidences of damage or discovery of artifacts	Zero incidences of damage or discovery of artifacts	No incidences of damage or discovery of artifacts	Contractor	Throughout construction period	Supervising Consultant	Throughout duration

Operations & maintenance phase	Impacts on community safety and health	Install traffic calming bumps to slow traffic Install marked pedestrian and animal crossings Install appropriate signage Walkways for pedestrians	Speed humps Zebra crossings Road signs Presence of walkways	Zero incidents	Several road safety related incidents per month	Contractor	Design	DIPE	Design review & approval stage
		Provided in urban sections Install bus laybyes with seating to cater for elderly & vulnerable passengers	Presence of bus stops with seat areas						
	Noise	Design speeds around residential hotspots should be reduced to 40kph Undertake noise monitoring	Community complaints	Less than 3 decibels increase in noise levels	30-70 dB(A)	Contractor	Design	DIPE	Design review & approval stage
	Impacts from Road and drainage construction	Design of cross drains and outfalls has been informed by hydrological studies Undertake construction according to the recommended design DIPE must monitor condition of road surface and drains as part of maintenance program to ensure longevity of road.	Community complaints Improper Culvert sizes and placement location Failure of infrastructure	All road drainage infrastructure including box culverts Conformity to road design manual	Inadequate drainage in several locations, flooding observed	Contractor	During design & construction period	DIPE	Monthly
	Vegetative cover/ overhang	The DIPE must have a maintenance program that allow for selective trimming of overhanging vegetation. No excessive clearing should be undertaken. Where necessary the Forestry Dept should be engaged to ensure endemic are not destroyed. The removal of vegetation must be limited to nuisance shrubbery	Road surface eroded and failing Loss of endemic vegetation Complaints by motoring public	Road surface maintained Minimal loss of endemics		DIPE	Operational	DIPE	Monthly
	Slope movement. Slippage, erosion	DIPE must implement monitoring programme. All slipped or eroded material must eb removed under the supervision of a qualified engineer All slipped or loose material must be carted away and disposed of in the Deglos land fill. Any exposed slope must be shaped to allow for angle of repose Revegetation of slopes must be undertaken All drains and culverts must be checked and unclogged Warning signs of potential slope movement and safety barriers must be placed for public notice to avoid injury Affected slopes must be monitored for movement	Incidence of blockage of motor way Public outcry Damage to road infrastructure Sedimentation of nearby waterways Loss of agricultural lands	Slopes monitored Slope stabilization measures implemented Minimal loss of agricultural lands Minimal disturbance to traffic and pedestrian movement	No loss of life Minimization of slope movement and erosion	DIPE	Operational	DIPE	Monthly

SECTION 10

BIBLIOGRAPHY

Anthony, D.1997. Inventory of Flora and Fauna of Gros Piton, St. Lucia, ENCORE Project Report.

Beard, J.S. (1944) Climax vegetation of tropical America. Ecology, 25, 127–158.

Beard, J.S. (1949) Natural vegetation of the Windward and Leeward Islands. Oxford Forestry Memoirs, 21, 1-191.

Beard, J.S. (1955) The classification of tropical American vegetation-types. Ecology, 36, 89-100.

Fournet, J. (1978) Flore illustrée des Phanérogames de Guadeloupe et de Martinique. Institute National de la Recherche Agronomique, Paris.

Graveson, R. (2009).The Classification of the Vegetation of Saint Lucia. National Forest Demarcation And Bio-Physical Resource Inventory Project Caribbean – Saint Lucia SFA 2003/SLU/BIT-04/0711/EMF/LC Graveson R. (2010) Louvet Terrestrial Survey.

Howard, R.A. (1974-1989) Flora of the Lesser Antilles. (Leeward and Windward Islands), volumes 1-.Arnold Arboretum, Harvard University, Cambridge, MA, USA.

Isaac, C., & Bourque, C.P.-A. (2001) Ecological life zones of Saint Lucia. Global Ecology & Biogeography, 10, 549-566.

The IUCN Red List of Threatened Species (2019). https://www.iucnredliSaintorg/ Plants of Saint Lucia (2019). www.saintlucianplants.com.

Beard, J. S. 1994. The Natural Vegetation of the Windward and Leeward Islands. Clarendon Press. Oxford.

Cox, C. 1999. A Rapid Inventory of the Flora and Fauna of the Petite Piton and Ridge Between the Pitons. Ministry of Agriculture, Forestry, Fisheries and the Environment - St. Lucia World Heritage Committee - St. Lucia.

Frank M. Clarke 2009. Mammals of St. Lucia - St. Lucia Forestry department

Graveson, R. 1998. Plant list of St. Lucia. Unpublished.

Government of Saint Lucia 1998. Biodiversity Country Study Report of Saint Lucia. Ministry of Agriculture, Forestry, Fisheries and the Environment, Saint Lucia.

Government of Saint Lucia. 2013 (rev 2016) *Disaster Vulnerability Reduction Project (DVRP)_Environmental Assessment (EA)& Environmental Management Framework (EMF),* Project Coordination Unit, Department of Planning and National Development, Ministry of Finance, Economic

Affairs and Social Security. Castries. December 2013, Revised March 2016 - http://www.finance.gov.lc/resources/download/2033

Government of Saint Lucia. (2013 rev 2016) *Disaster Vulnerability Reduction Project (DVRP)_ Social Assessment, and Resettlement Policy Framework.* Project Coordination Unit, Department of Planning and National Development, Ministry of Finance, Economic Affairs and Social Security. Castries. December 2013, Revised March 2016 - http://www.finance.gov.lc/resources/download/2033

Heholt,D (2013) *Disaster Vulnerability Reduction Project (DVRP)_ Social Assessment, and Resettlement Policy Framework.* Project Coordination Unit, Department of Planning and National Development, Ministry of Finance, Economic Affairs and Social Security. Castries. December 2013

Howard, R.A. 1997. Flora of the Lesser Antilles – Leeward and Windward Islands Vols. 1-4. Arnold Arboretum, Harvard University, Jamaica Plain, Massachusetts.

Jackson, I. 1989. Environmental Impact Assessment of the Jalousie Plantation Resort Project. Government of St. Lucia and UNDP.

Jean Pierre, L. L. 1988.Report on the Status of Flora and Fauna of the Area of the Proposed Piton National Park. St. Lucia National Trust.

Anthony, D. & Dornelly, A. (2008) St. Lucia. In Wege, D.C. & Anadon-Irizarry, V. (Eds) *Important Bird Areas in the Caribbean: Key Sites for Conservation*. BirdLife Conservation Series No. 15. BirdLife International, Cambridge.

AOU (1998 + supplements) Check-list of North American birds. Seventh edition. Washington, D.C.: American Ornithologists' Union. Downloaded from http://www.aou.org/checklist/north/index.php on 13 November 2009.

BirdLife International (2011) The BirdLife checklist of the birds of the world, with conservation status and taxonomic sources. Version 2. Downloaded 17 November 2011 from

http://www.birdlife.org/datazone/species/downloads/BirdLife_Checklist_Version_2.zip [.xls zipped 1 MB]..

Dornelly, A., Whitehead, H., Morton, M.N., Jn Baptiste, T., Regis, R. & Mitchell, N. (2007a) *Report on the 2007 Pilot Study to Evaluate the Feasibility of a Survey to Estimate the Population Size of the Saint Lucia Amazon.* Unpublished Report. Saint Lucia Forestry Department, Union and Durrell Wildlife Conservation Trust, Jersey.

Gilardi, J.D. & John, C.L. (1998) Conservation of the St. Lucia house wren *Troglodytes aedon mesoleucus*: distribution, abundance and breeding biology. *Dodo (Jersey Wildlife Preservation Trust),* 34, 91-102.

Graveson, R. (2009) *The Classification of the Vegetation of Saint Lucia*. Technical Report to the National Forest Demarcation and Bio-Physical Resource Inventory Project, FCG International Ltd, Helsinki, Finland.

Grimshaw, T. (2005) *A Report from birdtours.co.uk. Saint Lucia, October 23rd to November 6th 2005* [online] http://www.birdtours.co.uk/tripreports/st.lucia/st.lucia4/st-lucia-nov-05.htm

IUCN (2009) *IUCN Red List of Threatened Species. Version 2009.1.* <www.iucnredlist.org>. [Downloaded on 27 October 2009].

John, C.L. (2001) *Attitudes Towards Hunting And The Development Of A National Wildlife Policy In St. Lucia*. Unpublished Report. Saint Lucia Forestry Department, Union.

John, C.L. (2004) *Migrant Bird Records for Saint Lucia, West Indies*. Unpublished Report. Saint Lucia Forestry Department, Union.

Keith, A.R. (1997) *The Birds of Saint Lucia. An Annotated Check-list.* B.O.U. Check-list No. 15. British Ornithologists Union, Peterborough, U.K.

Morton. M.N. (2007b) *Occupancy Estimation Pilot Study 2007: Notes for Surveyors*. Unpublished Report. Durrell Wildlife Conservation Trust, Jersey.

Morton, M.N., Jn Baptiste, T., Whitehead, H., Regis, R., Mitchell, N, Jn Baptiste, L. & Dornelly, A. (2008) *Saint Lucia Amazon Survey 2008: Estimating the Effect on Flying Parrots and of Disturbance Due to Counting on a Population Estimation Method.*Unpubl. Report. Saint Lucia Forestry Department, Union and Durrell Wildlife Conservation Trust, Jersey

Raffaele, H., Wiley, J., Garrido, O., Keith, A. & Raffaele, J. (1998) *A Guide to the Birds of the West Indies.* Princeton University Press, Princeton, New Jersey.

Toussaint, A, John,L, Morton, M. (209) *Status and conservation of Saint Lucia's forest Birds*. Technical Report No. 2 to the National Forest Demarcation and Bio-Physical Resource Inventory Project, FCG International Ltd, Helsinki, Finland.

Toussaint, A 2007. Birds of Saint Lucia, West Indies.

US Fish and Wildlife Service. 2008. Neotropical Migratory Bird Conservation Act: Bird List. Download from http://www.fws.gov/birdhabitat/grants/nmbca/BirdList.shtm on 17 November 2009.

Wege, D.C. & Anadon-Irizarry, V. (Eds) 2008. *Important Bird Areas in the Caribbean: Key Sites for Conservation*. BirdLife Conservation Series No. 15. BirdLife International, Cambridge.

Wiley, J. W., R. S. Gnam, S. E. Koenig, A. Dornelly, X. Galvez, P. E. Bradley, T. White, M. Zamore, P. R. Reillo, and D. Anthony. 2004. Status and conservation of the family Psittacidae in the West Indies. Journal of Caribbean Ornithology 17, 94–154. (Special issue).

Wingate, D. (1969) *A Summary of the Status of the Saint Lucia Parrot,* Amazona versicolor*, and Other Rare Birds of Saint Lucia*. Unpublished Report. International Council for Bird Preservation, Washington, D.C.

Young, R.P., Marsden, S., Jn Baptiste, T., Dornelly, A., Whitehead, H., Young, G., Morton, M. N. et al., A status assessment of the Saint Lucia Amazon, *Amazona versicolor.* In preparation.

Renard, Y. 2001. Practical Strategies for Pro-poor Tourism: A Case Study of the St. Lucia Heritage Tourism Programme. PPT Working Paper No. 7. Centre for Responsible Tourism, Overseas Development Institute and International Institute for Environment and Development, London.

Ministry of Agriculture, Lands, Forestry and Fisheries (2011). „Strategic Framework for the Ministry of Agriculture, Lands, Forestry and Fisheries - Disaster Risk Reduction in Agriculture, Forestry and Fisheries".

Mott MacDonald (2013). „Landslide Risk Assessment for Saint Lucia"s Primary Road Network". Hurricane Tomas Rehabilitation and Reconstruction Draft Conceptual Design Report. Ministry of Infrastructure, Port Services and Transport, Government of Saint Lucia.

The government of Saint Lucia (2007). Ministry of Physical Development, Environment and Housing. „National Land Policy". NationalLandPolicy.pdf

Jacoby, H. G. (2000), "Access to Markets and the Benefits of Rural Roads", The Economic Journal, Vol. 110, No. 465, pp.713-737 Retrieved from: http://wwwwds. worldbank.org/external/default/WDSContentServer/IW3P/IB/2000/02/24/000094946 99031 91111170/ Rendered/PDF/multi_page.pdf

St Lucia national Vision Plan

Bansal, A. N. and Patil, B.R.(1979), "Socio Economic Impact of Roads on Village Development", New Delhi, NCAER

ST. LUCIA COUNTRY POVERTY ASESSMEMT 2005/06 VOLUME I: MAIN REPORT

Jacoby, H. G. (2000), "Access to Markets and the Benefits of Rural Roads", The Economic Journal, Vol. 110, No. 465, pp.713-737 Retrieved from: http://wwwwds. worldbank.org/external/default/WDSContentServer/IW3P/IB/2000/02/24/000094946 99031 91111170/ Rendered/PDF/multi_page.pdf

Bansal, A. N. and Patil, B.R.(1979), "Socio Economic Impact of Roads on Village Development", New Delhi, NCAER

Summary Findings of the 2016 Survey of Living Conditions and Household Budgets By Edwin St Catherine, Director of Statistics July 6, 2017

SECTION 11

APPENDICIES

APPENDIX 1

TERMS OF REFERENCE (Extract)

GOVERNMENT OF ST. LUCIA
Department of Infrastructure, Ports, Energy

TERMS OF REFERENCE
FOR
CONSULTING SERVICES
FOR
DETAILED DESIGNS FOR RECONSTRUCTION OF THE VANARD (VENUS) – ANSE LA RAYE LINK ROAD
&
SUPERVISON

MIPEL
APRIL 2017
September 15, 2017, PCU & DIPE
Updated incorp. Bank Comments

TERMS OF REFERENCE
VANARD (VENUS) – ANSE LA RAYE LINK ROAD
DETAILED DESIGNS AND SUPERVISION

1. BACKGROUND

The Government of St. Lucia (GOSL) has secured financing towards the implementation of the Disaster Vulnerability Reduction Project (DVRP) from the International Development Association and the Climate Investment Fund. The Disaster Vulnerability Reduction Project aims to measurably reduce the Country's vulnerability to natural hazards and climate change impacts, and includes various activities related to institutional strengthening and training as well as the execution of various civil works to improve the resilience, preparedness, and response capacity of Saint Lucia to natural hazards.

The DVRP is being implemented by the Department of Economic Development, Transport and Civil Aviation through the Project Coordination Unit (PCU) while the Department of Infrastructure, Ports and Energy (DIPE), is the technical Implementation Agency responsible for managing the civil works activities.

Component 1 – Risk Reduction and Adaption Measures of the DVRP includes financing for the reconstruction and retrofitting of public infrastructure including roads. The GOSL, through the Department of Infrastructure, Ports, and Energy now seeks to rehabilitate8.75 km of road in the District of Anse La Raye, the Vanard (Venus) – Anse La Raye Link Road; with a view to significantly improve the quality of that road. In undertaking this Road Rehabilitation Project, the GOSL seeks to fulfill its mandate in improving the motorability, general conditions and resilience of the existing roadway. The deteriorating condition of this road network result in exorbitant vehicular operating costs to farmers, and residents as well as certain sections have become inaccessible.

Reports emanating from feasibility studies carried out by the GOSL (DIPE) as part of the Tertiary Roads Development Program as part of GOSL's ongoing National Roads Development Program are as follows:

- Tertiary Roads Development Program and Institutional Strengthening, Final Report and Annexes (3 Volumes), DIWI Consult International, GmbH, January 2002.
- Feeder and Agricultural Roads Phase 1, Feasibility Study DIWI Consult International, GmbH, December 2004.
- Agricultural and Economic Feeder Roads Program, Evaluation Report, Halcrow Group Ltd, January 2010.

With a view to improving the existing conditions of the roadway the Department of Economic Development, Transport and Civil Aviation seeks to engage a Consulting Firm to prepare detailed engineering designs for the rehabilitation/reconstruction of the Vanard (Venus) to Anse La Raye Link Road and to carry out supervision services of the proposed works.

Given that the Vanard (Venus) to Anse La Raye Link Road provides an alternate access for commuters between the two communities (Millet and Anse Lan Raye) it is imperative that the proposed designs allow for works allow for uninterrupted flow of traffic during the construction

phase. The designs should also be incorporate climate resilience principles and standards so that constructed roadway can withstand weather related phenomena and is resilient to the effects of climate change.

2. OVERALL OBJECTIVE

The objective of this consultancy is to engage a firm to prepare detailed designs (technical information, specifications, work requirements, drawings and detailed bill of quantities) for the rehabilitation/reconstruction of the Vanard (Venus) to Anse La Raye Link Road in accordance with international standards approved for climatic conditions similar to that of Saint Lucia including seismic conditions and carry out supervision services of then proposed works.

The specific objectives of the assignment are for the Consultant to prepare detailed designs, provide pre-construction services and construction supervision and post-construction services, to ensure that the completed works are in compliance with the signed contract and consistent with the agreed / approved designs.

3.0SCOPE OF SERVICES

The Consulting firm shall the services detailed in these Terms of Reference as expeditiously and with the highest professional skills and care. During all stages of the assignment then Consulting Firm shall make all efforts to maintain full coordination with the Client – Department of Infrastructure, Ports and Energy (DIPE), and stakeholders' including the Department of Economic Development, Transport and Civil Aviation to ensure a common understanding of the assignment. The Firm should allow for citizen engagement throughout execution of the assignment.

The consultancy shall include two phases:

Phase 1- Detailed Designs which includes engineering surveys, engineering designs and
Phase 2- Pre-Construction services, Construction Supervision and Post-Construction services.

Services to carried out under Phase 2 will be undertaken then basis of satisfactory performance under Phase 1 and upon mobilization of a Contractor for the proposed works. The Services will be contracted under two separate contracts for each phase. Phase 1 Contract will be a lump sum form of contract and payments under the Contract will be based on the submission and acceptance of deliverables by the Client. Phase 2 will be contracted time-based contract using a fixed price and fixed rates for services.

The Consultant shall be responsible for the following services:

Designate a competent expert to serve a lead and to provide regular updates to the Client on all matters.

Coordinating, interacting and reporting at least weekly with the Client. Copies of coordination meetings, reports should also be forwarded to the Department of Economic Development, Transport and Civil Aviation and to the PCU.

Providing full Construction Administration Services during the construction and post-construction periods.

PHASE 1: DETAILED DESIGN SERVICES

It is anticipated that the road improvements will generally utilize the existing road alignment except where cost savings or other benefits can be shown for an alternative alignment.

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

a. Review and use existing topographic and cadastral maps, of the site, surroundings and watershed for the purpose of conducting the relevant ESIA to inform the designs. Where existing data may be limited undertake necessary physical, cultural, and biological surveys for enhancement and purpose of the assignment

b. Undertake an Environment and Social Impact Assessment (ESIA) to determine potential impacts that may occur during the construction of the proposed works and the corresponding mitigation measures that will be described in an Environmental and Social Management Plan (ESMP). The Environmental and Social Impact Assessment shall be conducted in accordance with the Environment and Social Assessment Framework developed for the DVRP.

c. The environmental assessment part of the ESIA should describe the legal framework, physical and biological setting, potential project impacts, and measures to avoid, minimize or mitigate them. In particular the ESIA for Venus Anse la Raye Road should assess the presence of the Saint Lucia Parrot and the fer-de-lance in the vicinity of the project, as well as the vegetation and trees that may be used by these species for nesting, forage, or shelter; water quality in streams and rivers especially near the WASCO intake and the runoff from the quarry near Anse la Raye; and the existence of soft or loose soils, silts and sands that may require special measures to stabilize them, prevent landslips, stop erosion, and prevent runoff from affecting streams and rivers.

d. The socioeconomic part of the ESIA should clearly detail the extent of the resultant impact of the works, potential impact on private property, likelihood of displacement of livelihoods and of affected persons, potential damage to crops as well as the potential social or economic benefit, areas for possible land take for the purposes of construction for temporary

or permanent use and to facilitate compensation for acquisition of private property. For the affected households, it should include the composition of the households in term of gender and age (noting the children and the elderly)

e. The ESIA shall address health and safety aspects for workers and for the nearby communities, especially as regards access across work zones, traffic safety, and safety near excavations, trenches, and slopes.

f. Based on the findings of then ESIA develop an Environmental and Social Management Plan (ESMP). Appendix 9 of the Environmental Assessment and Environmental Management Framework (EA/EMF) developed for the DVRP includes an outline for an EIA report and other information that will serve as guides for this purpose.[1] The ESMP should clearly describe the mitigation measures, responsibilities, supervision arrangements, and reporting requirements for the contractor, the supervision firm, and the PCU.

ENGINEERING SURVEYS

a. Review and use existing topographic and cadastral maps, of the site, surroundings and watershed for the purpose of conducting the relevant ESIA, hydrological, hydraulic assessment /analysis to inform the designs. Where existing data may be limited undertake necessary topographic, cadastral and other surveys for enhancement and purpose of the assignment

b. Use existing studies and or carry out all detailed surveys including traffic to determine loading, precise location of the road alignment, drainage requirements and for preparation of technical information. Traffic surveys should give consideration to seasonal variations, incidence of delays and other constraints set by the present road and bridges, different types of vehicles, existing traffic volume data, axle loadings and the projected traffic growth on which the pavement design is to be based. The forecast will cover the medium term (about the next ten) years in detail and the longer term. The analysis will also constitute a baseline against which the project may be evaluated in the future; the findings should therefore be presented in a manner, which facilitates comparison with an ex-post survey.

c. Undertake condition assessments including structural, strengths of all drainage infrastructures, bridges and retaining walls and conduct slope stability analysis of critical slopes and embankments along the link road

g. Conduct hydraulic capacity of all existing drainage infrastructure and determine the adequacy of the capacity of these structures. The Capacities shall be assessed in accordance with the following Annual Exceedance Probabilities (AEP); Drains – AEP 10%; Culverts – AEP 2%; Bridges – AEP 1%.

h. Conduct hydrological modelling using various climatic scenarios and hydraulic analysis of the catchment to inform the designs

[1] http://www.govt.lc/publications/environmental-assessment-and-environmental-management-framework-for-the-disaster-vulnerability-reduction-project-dvrp-

APPENDIX 2

PERMITTED DEVELOPMENT

Schedule 3 of the Physical Planning and Development Act No 29 of 2001- PERMITTED Development

SCHEDULE 3 **(Section 18)**

PERMITTED DEVELOPMENT

(a) A Garden Huts, other than garages, in approved residential areas and not used for human habitation or for the conduct of any activity of a commercial nature.

(b) Gates, fences, and walls not exceeding 4 feet in height.

(c) Agricultural out buildings not used for human habitation and enclosures and works on agricultural holdings that are requisite for or incidentail to the use of land for the purpose of agriculture not including subdivision of land for agricultural purposes.

(d) Repair to roads, bridges and harbour installations

(e) Repair to services

(f) Internal alterations to buildings not involving changes to the basic structure or façade of the buildings

(g) Subject to any requirements of the regulations prescribing minimum building setback, site coverage, and building height limitations, the enlargements or improvement of an existing single dwelling house provided that the floor of the enlargement or improvement does not exceed 1/3 of the floor area of the existing single dwelling house.

(Amended by Act3 of 2005)

APPENDIX 3

PHOTOGRAPHS OF ROAD CONDITION

Photo Gallary of Main Access Through the Durandeau Community

Photo--1

Photo---2

Quality of Main Access through the Settlement

Photo--4

Photo--4

Photo--5

APPENDIX 4

FLORA & FAUNA STUDY

FAUNA ASSESSMENT OF VINUS ROAD

Photo by Dr. Glen Young

Prepared by Adam Toussaint
February 11, 2020

1. EXECUTIVE SUMMARY

This report presents the finding of point count assessment avifauna of the Venus Road, referred to as the study area. A desktop study of four (4) other taxa was also chosen to represent the state of fauna diversity in the study area.

The focus on birds were also due to that fact that diversity of birds, especially endemics and endangered species are found to be more plausible indicator species for the states of biological diversity in the study area. Lindenmayer 1999, argues that indicator species concept can make an important contribution to biodiversity conservation because of the impossibility of monitoring all taxa in species-rich forest environments.

A total of 24 birds species were recorded in the Seven (7) sample plots established for monitoring the birds. The survey results indicate that 5 endemics, Nine (9) of 16 Saint Lucia Priority Bird Species were occurring in the study area with varying geographic distribution.

Based on the International Union for the Conservation Nature (IUCN), the authority on defining the extinction risk of species assessed based on nine categories. The species assessed falls into 4 categories: One (1) Engendered (EN), One (1)Near Threaten (NT) and One (1) Venerable (VU). The remaining species found occurring were classified as Least Concerned (LC), meaning that there is no immediate threat to the survival of the species.

The report produced by this survey made several recommendations for priority bird species and other endangered fauna found in the Study area. The information produced may also be useful to set priorities, allowing mitigation and conservation efforts to be focused on those species that are of greater risk of extinction locally, regionally or globally.

2. METHODOLOGY

Standardized bird counts

This survey used standardized point counts at survey plots to obtain a sample f species occurring along the Venus road. The surveyor (A. Toussaint on all occasions) stood at a survey point and detected (saw and/or heard) as many bird species as possible, scanning in all directions. For each species, the number of individuals detected was noted (D. Clament). This was done for a 10 minute interval, starting at the surveyor"s arrival at the survey point. The period of 10 minutes was chosen to make the data from this survey more readily comparable with data from previous bird surveys. The surveyor then repeated this count for an additional two minutes whilst „pishing" – imitating a generalized alarm call to draw birds in towards the surveyor.

Allocation of survey points

Seven (7) sample points were randomly allocated along the road (see figure 3).

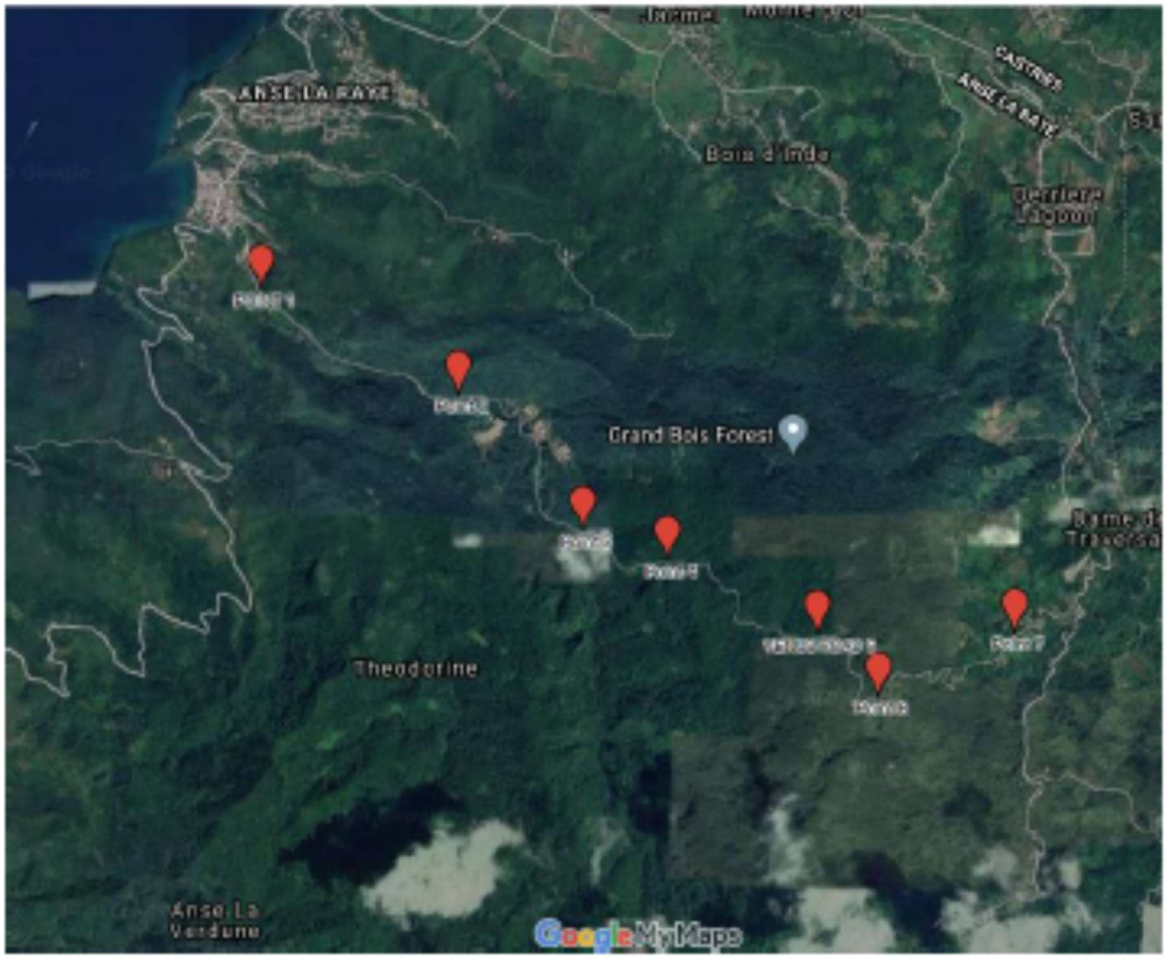
Equipment used include binocular was used to aid in the identification of birds. A field technician (D. Clement) took records of the species sighted or heard for all birds found in the various point stations. The records were taken on a field notebook and later entered in an Excel spreadsheet. Summary data of species is presented in Annex 111. Habitat association for all birds detected was also recorded. In addition, photographs were taken using a Canon EOS 7D Mark II camera with Canon EF 400mm 1:5.6 Lens.

The researcher focussed resources on a sample assessment of priority bird species listed for Saint Lucia. Information on endangered and endemic avifauna along the Venus Road was seen as necessary because it is more amenable to the standard point count methodology and requires less material resources. More so, it does not require mist nets and traps that are used in the assessment of mammals and insects.

The focus on birds were also due to that fact that diversity of birds, especially endemics and endangered species are found to be more plausible indicator species for the states of biological diversity in the watershed. Indicator species concept can make an important contribution to

biodiversity conservation because of the impossibility of monitoring all taxa in species-rich forest environments (Lindenmayer 1999).

Figure 1 – Point Stations Established Along the Venus Road



The selection of the priority species for the Venus Road was based on the presence of species listed by Toussaint et al (2009), in the study area. The point stations in which the species were found were highlighted on a My-Google map for a suite of 6 targeted priority species. Photographs of these species were taken and included in the final report. The targeted priority species include those that are important, rare or endangered, specifically:-

- Any indigenous (native) species listed as globally threatened by the International Union for the Conservation of Nature (IUCN) and/ or listed as nationally threatened with extinction. (Annex 1 describes the IUCN threatened species categories).
- Any non-IUCN Red Listed indigenous (native) species that appear to be: scarce, rapidly declining, endemic to Saint Lucia, known or suspected to have highly specialised needs, or are vulnerable to hybridisation with introduced species.
- Species that perform a keystone role in the ecosystems identified in the above section.
- Indigenous species that serve as indicators for ecosystems or certain conditions.
- Species that are or could be used as flagships for forest conservation

Recommendations for mitigation measures were formulated based on the best available information, knowledge and experience of the area and the behaviour of the avian species.

3. RESULTS

Frequency

A total of 24 avifauna species and total number of birds was 208 individual birds recorded in the study plots during the two days assessment, January 27 and 28 2020. Maximum number of individual in one plot was 46 (20%) in plot 1 and minimum number n=13 (7%) was found in plot 4, with a mean number of 30 individuals. The highest species diversity was found in plot 1 and the lowest in plot 4.

It is not worthy to mention that plot 1 was located adjacent to a riparian zone, with mixed agriculture and secondary forest on one side, which can be describe as ecotone. According to definition in Wikipedia, an ecotone is a transition area between two biomes. It is where two communities meet and integrate. It may be narrow or wide, and it may be local or regional. An ecotone may appear on the ground as a gradual blending of the two communities across a broad area, or it may manifest itself as a sharp boundary line. Ecotones are also rich areas of diversity and species richness, as demonstrated in plot 1.

Whereas, plot 4 was located within a primary forest area and contained less diversity and richness of species. A number of factors may contribute to this finding, for example, the detection of species could be more difficult due to the density of vegetation on the study plot. Time of day was also a factor; in this case plot 4 was assessed at 11:30 AM January 27 and plot 1, at 6:30AM on the same day. Therefore, time of assessment is a major factor in assessing avifauna species.

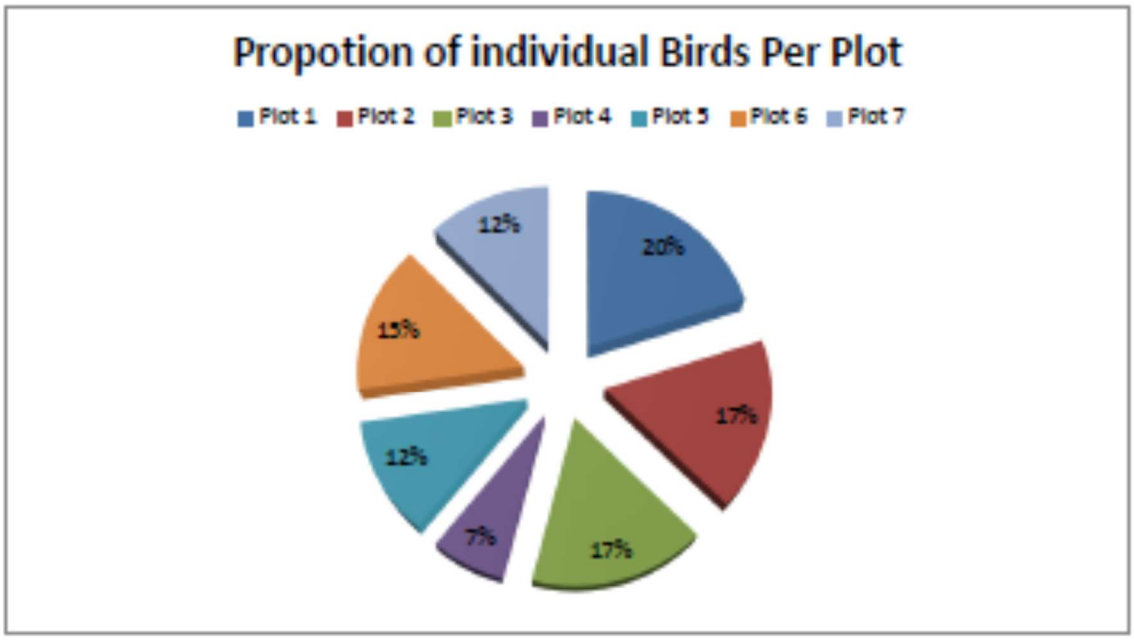


Figure 2: Proportion of Birds per Plot in the Study Area

The Saint Lucia warbler was the highest ranked species based on frequency in the survey area (n=31), followed by Lesser Antillean Bullfinch (n=24) and Banana Quit (n=20). Figure 3 below show the ranking of species detected. Ruddy Quail-Dove, Mangrove Cuckoo, Lesser Antillean flycatcher, Broad-winged Hawk and little blue heron has mininmum frequency (n=1) in the study area. Figure 3 below show species frequency in the study area.

All five endemic bird species listed for Saint Lucia were detected in the study area in varying degree of frequency and distribution. As mention above, the Saint Lucia Warbler (n=31) was the most frequent endemic species, followed by the Saint Lucia Parrot (n=112) and the Saint Lucia Black Finch (n=7). These findings indicate that the habitats along the Venus Road are very important and contain species found occurring only in Saint Lucia.

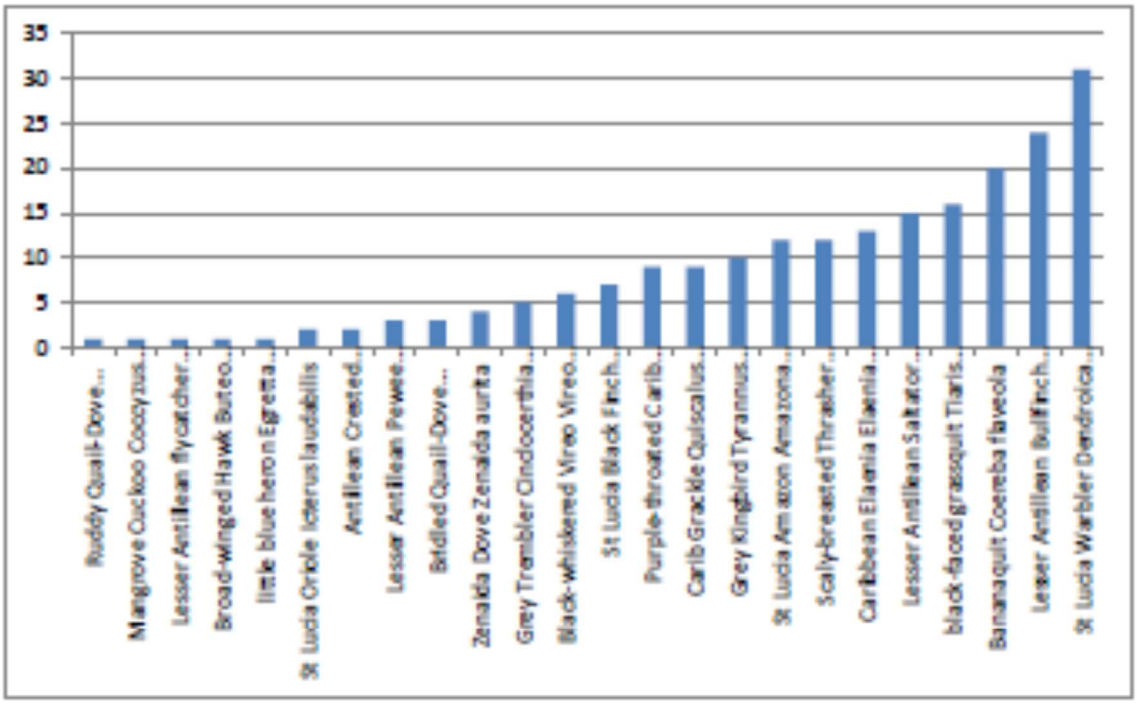


Figure 3: Species frequency in the Study Area

Nine (9) Saint Lucia Priority Bird Species for Conservation (figure 4) out of a total of 16 were found occurring in the study area. Annex III below provide a list f the Priority Species for Saint Lucia and subsequent section give descriptions of each species with photographic images. In the suit of Priority Bird Species, the Saint Lucia warbler was the highest ranked (n=31 or 39%), followed by the Lesser Antillean Saltator (n=15 or 19%) and the Saint Lucia Parrot (n=12 or 15%). The Lessor Antillean Fly Catcher (n=1 or 1%) and the Saint Lucia Oriole (n=2 of 3%) occurred at very low frequency (Figure 4 and 5). No specific reason can be associated with the low frequency and distribution of these two priority species. It is worth noting that the list of priority species occurring in the study area is consistent with the same habitat type in Saint Lucia.

IUCN Category of species includes, One (1) Engendered (EN), Saint Lucia Black Finch and one (1) Near Threaten (NT), Saint Lucia Oriole and one Vulnerable (VN), Saint Lucia Parrot. All the reaming species were categorized as Concerned (LC). Annex 1 provides detail on the IUCN criteria for classification.

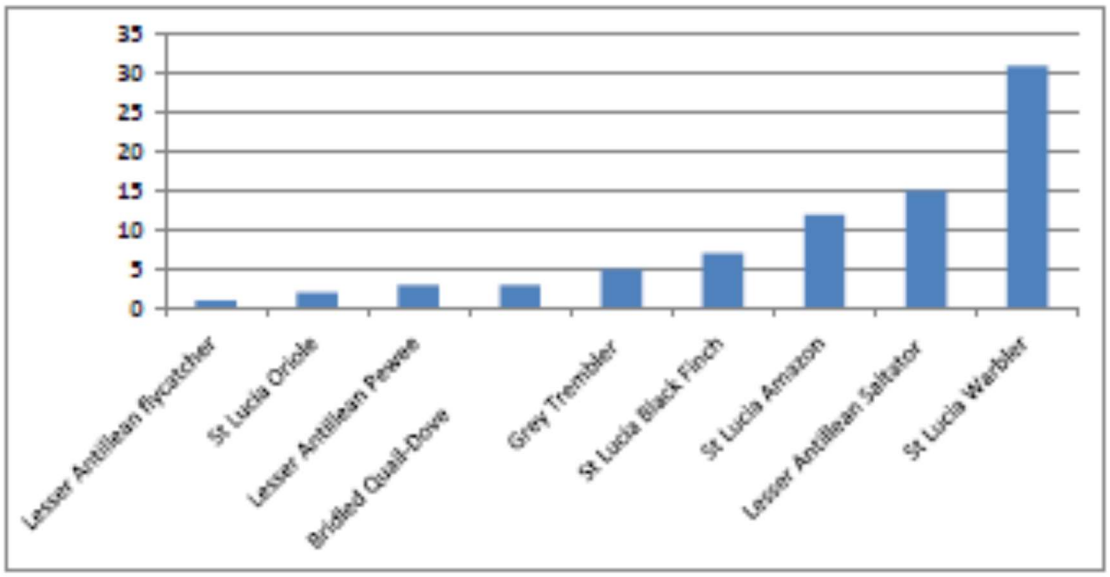


Figure 4: Ranking of Priority Bird Species for Saint Lucia Occurring in the Study Area

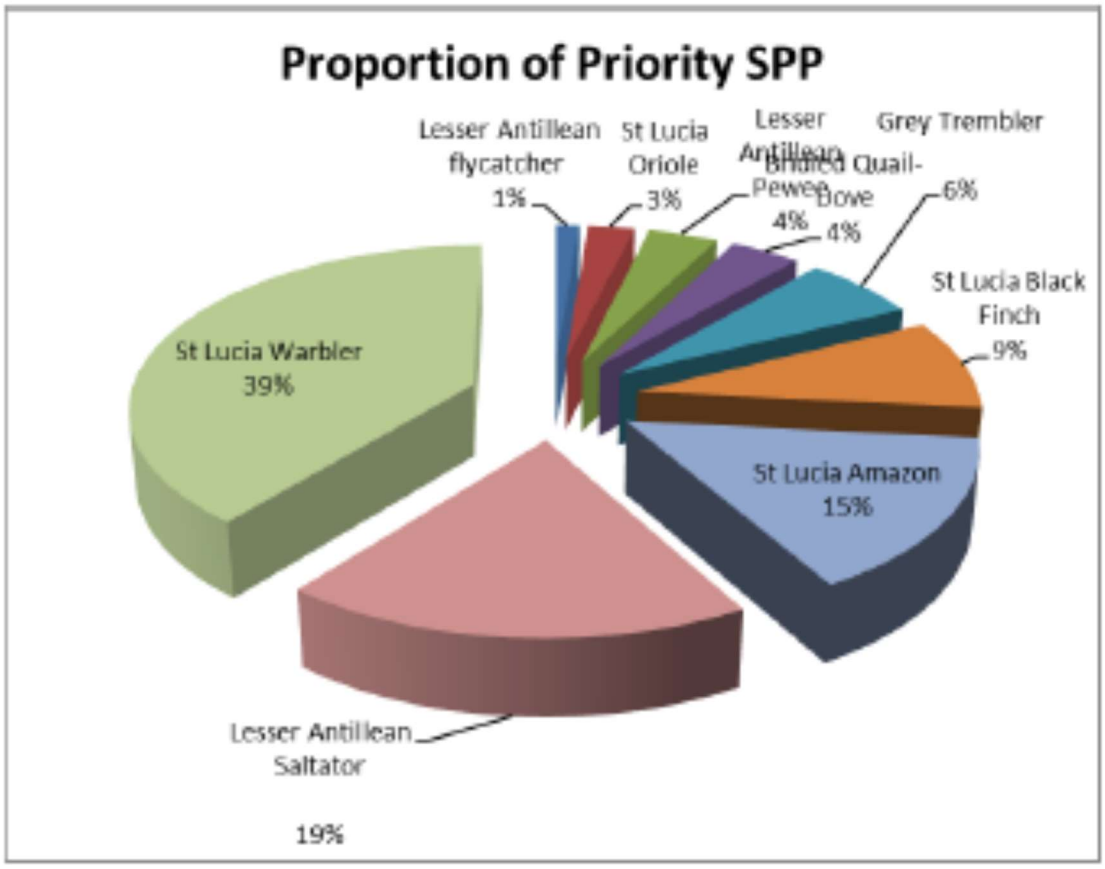


Figure 5: Proportion of Saint Lucia Priority Bird Species Occurring I the Study Area

Discussion on Individual Distribution of Targeted Priority Birds Species in the Soufriere Watershed

ST. LUCIA ORIOLE *Icterus laudabilis*

Local Name: Carouge

Two (2) Saint Lucia Oriole were recorded in the study area and was distributed in two study plots or points. These were plot 1 and 3, which were ecotone habitats and mixed agriculture holding near forested areas, respectively.

According to the IUCN, the Saint Lucia Oriole is classified as Near Threatened because it has an extremely small range and small population and, although numbers appear to be stable at present,

population trends are poorly known and should be monitored. The oriole is widely distributed in low frequency on the island and inhabits coastal vegetation, dry scrub, edges of banana plantations, plantation forest, secondary and primary forest up to 700 m.

The Saint Lucia oriole may deserve special attention because of the unresolved matter of the level of two likely impacts on its population. Firstly, it is susceptible to brood parasitism by the shiny cowbird *Molothrus bonariensis minimus* a species found predominantly in cleared areas and hence likely to increase with increasing human impacts on the landscape (Keith 1997). Keith (1997) also mentions the possibility of harassment by the Spectacle Thrush (*Turdus nudigenis nudigenis*). Secondly, it has been speculated that the oriole, as a species favoring the edges of banana gardens (Keith 1997), may also be susceptible to secondary poisoning from agrichemicals. However, there has been no empirical assessment of the impact of either brood parasitism or secondary poisoning on this species. Notwithstanding the lack of empirical evidence to support the above mentioned treat to the species, it is worthy to mentioned that the Shiny Cowbird and the Spectacle Thrush were both found occurring in the watershed which can possibly be a potential threat to the species

Figure 6 –ST. LUCIA ORIOLE

ST. LUCIA WARBLER **DENDROICA DELICATE**

Local Names: Chic-chic, Sequia Ba bad

The Saint Lucia Warbler was distributed in all point assessed in the study area. The species was the most frequent species occurring in the study area. The warbler in this survey and in the 2009 island wide bird survey was the most frequent endemic and Priority Species occurring species, but ranked 5th in all birds frequent in that island wide survey.

The conservation status as LC is warranted for this species in based on findings here.

The warbler was found occupying a wide range of habitats in the study area. They feed actively, gleaning insects and spiders from leaves and twigs. Although the global population size has not been quantified, the species is listed as Least Concern (LC) because it is not believed to approach the thresholds for the population decline criterion of the IUCN Red List (i.e. declining more than 30% in ten years or three generations).

Figure 7 – ST. LUCIA WARBLER Dendroica delicate

SAINT LUCIA PARROT: *AMAZONA VERSICOLOUR* (ENDEMIC)

Local Name: Jacquot

The Saint Lucia parrot was represented in three (3) study points. The parrots' habitat is primarily moist forest in the mountains, but it can also occur in the secondary forest and cultivated areas which characterize the habitat in the Venus area. They travel considerable distances to feed in the forest canopy on a wide variety of fruits (including awali, mangoes, wild passion fruit, etc.), seeds, flowers and sometimes insects. The parrots roost deep in the forest, flying out to the edges to forage during the day.

The breeding season is primarily from February to May. The parrots nest in cavities of tall trees (gommiere, chataniere and others) where the adult female lays two (occasionally three) white eggs deep inside a hollow tree trunk.

Figure 8-**SAINT LUCIA PARROT**

LESSER ANTILLEAN PEWEE *Contopus oberi*

Local Names: Gobe-Mouche, or Pin Kaka

The Lesser Antillean Pewee also classified as the Saint Lucia pewee is a small flycatcher which was found occurring only 2 study point, plot one and plot 2, and also at very low frequency (n=3). This species is listed as a Least Concern species by the IUCN and is found in a wide range of forested habitats ranging from the coast to the interior of Saint Lucia. They generally occur in the forest understory; hence the maintenance of the understory in the forested areas is important for the conservation of the species.

Figure 9–LESSER ANTILLEAN PEWEE *Contopus oberi*

ST. LUCIA BLACK FINCH *MELANOSPIZA RICHARDSONI*

Local Name: Moisson Pied-blanc

The Black Finch was distributed in Three (3) point stations in the study area. Seven (7) individuals were encountered and recorded during the study , in plot 4, 5 andd 6 which are dominated by primary forests. This species is listed by the IIUCN as an Endangered Species (EN). This species qualifies as Endangered because it has a very small global population and frequency in it range is considered to be low. Such is not the case for the along Venus Road, especially in the primary forested areas.

This birds feed primarily on the ground on seeds, fruit and insects; at times they can be seen feeding on berries of low shrub plants in the under canopy. This feeding behavior makes the bird very

vulnerable to predators such as mongoose, rats, feral cats and other alien invasive species. The decline in habitat through clearance for agriculture, urban and tourism development can impact on it range.

ST. LUCIA BLACK FINCH *Melanospiza richardsoni*

Figure 10– Fig. Female Saint Lucia Black Finch

Figure 12 – Male Saint Lucia Black Finch

LESSER ANTILLEAN SALTATOR ***Saltatoralbicollis***

Local Name:Gros-bec

This is a common year-round resident on Saint Lucia which occurs primarily in the second growth, dry scrub and forest edge undergrowth at lower to mid elevations. The species occurred in four (4) point at medium frequency (n=15) in the study area.

The species is categorized by IUCN as Least Concern (LC) because the population is not believed to be decreasing sufficiently rapidly to approach the thresholds under the population trend criterion (>30% decline over ten years or three generations). The population size has not been quantified, but it is not believed to approach the thresholds for Vulnerable under the population size criterion ((<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure), The IUCN Red List of Threatened Species.

FIGURE 13: LSSOR ANTILLEAN SALTATOR

GREY TREMBLER ***Cinclocerthiagutturalismacrorhyncha***

Local Name: Trembleur

Grey Trembler are known to occurs at all elevations and can be seen in both moist and semi-arid forest and woodlands in Saint Lucia. Saint Lucia and Martinique comprise the entire range of the Grey Trembler.

The specie was found occurring in two (2) points, point 1 and 5, and was frequent (n=5), with point 5 having the highest density (4).

According to the IUCN, this species is Least Concern (LC) although it may have a small range, it is not believed to approach the thresholds for Vulnerable under the range size criterion (Extent of Occurrence <20,000 km2 combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). The population trend

appears to be stable, and hence the species does not approach the thresholds for Vulnerable under the population trend criterion (>30% decline over ten years or three generations).

Figure 14 : GREY TREMBLER ***Cinclocerthiagutturalismacrorhyncha***

LESSER ANTILLEAN FLYCATCHER ***Myiarchus oberi sanctaeluciae***

Local Name: Pipirite Gros Tête

Lesser Antillean Flycatcher is a rare and elusive bird in Saint Lucia, primarily found in the transition forest at medium elevation and in the rainforest. The flycatcher was encountered in only one (1) sample points, with limited frequency (n=1) in the study area. It must be admitted this bird is very elusive and a challenge for detection.

This species is of Least Concern (LC) although it may have a small range, found in Barbuda, Dominica, Guadeloupe, Martinique, Saint Kitts and Nevis, and Saint Lucia, it is not believed to approach the thresholds for Vulnerable under the range size criterion.

FIGURE 15: LESSER ANTILLEAN FLY-CATCHER

. **BRIDLED QUAIL DOVE** *Geotrygon mystacea*

Local Names: Colombe à Croissants, Perdrix Croissant (Guad, Mart. St L)

The white streak below the eye, brown upperparts (except for crown and neck) and reddish brown limited to a patch on the wing are good field marks for the identification of the Quail Dove. The female is less iridescence on hind neck and upper back.

The distribution and frequency of the Quail Dove in the study area was limited to only two plots, 2 and 4 of the sample sites in which just 3 individuals were recorded. The rarity in frequency and distribution of the dove in the Venus road area is reflective of the species account in national

surveys data, 2009 (M.Morton pers. Comm.) and the Status and Conservation of Saint Lucia Birds (Toussaint et al 2009).

Despite the fact that the population trend appears to be decreasing, the decline is not believed to be sufficiently rapid to approach the thresholds for Vulnerable under the population trend criterion (>30% decline over ten years or three generations) Birdlife International 2011)). It must be admitted that the population size of this dove has not been quantified, however, the species is evaluated as Least Concern (LC), by the IUCN. The LC category was given mainly because it is believed that the global population have not approach the thresholds for Vulnerable under the population size criterion ((<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure) Birdlife International 2011)).

4. 

.FIGURE 16: **BRIDLED QUAIL DOVE** *Geotrygon mystacea*

Desk Top Study of Mammals, Reptiles and Amphibians in The Study Area

There are 10 known native mammals listed for Saint Lucia; 9 of the 10 mammals are bats. The large endemic Saint Lucia musk rat (Megalomys luciae) is the only non-bat native mammal, which is now believed to be extinct in the wild (Clarke, 2009).

Mammalogist Dr Frank Clarke, assisted by forestry conducted fieldwork for 12 weeks from 16th January to 08th April 2009. The objective was standardized assessments of the diversity and relative abundance of mammals at more than 20 sites among key forest types identified by the project botanist and critical habitat specialist as occurring on St Lucia.

Only one of the 20 survey point established and assessed by was located in the Millet , area and can be use to extrapolate over wider area including the Venus Road.

Dr. Clarke describe most of the bats are widespread throughout the island and therefore the same can be said for the target watershed. Clarke also concluded many bat species are in decline due to the loss of forest cover, major roost sites and other factors, and Saint Lucia.

The 2009 mammal survey captured more than 370 mongoose, opossum, rats, and agouti were recorded (observed directly, indirectly observed, trapped or captured). The most widely-distributed and most commonly observed and trapped mammal is the small Asian mongoose, an introduced species that is a major threat to St Lucia's native birds, reptiles, and amphibians.

All of these species described as widespread are known to occur in the Venus road area.

Table III: Bats Species Occurring On Saint Lucia and recorded in the general Millet Anse La Ray Watersheds

LOCAL NAME	SCIENTIFIC NAME	GEOGRAPHIC STATUS	CONSERVATION STATUS
Jamaican Fruit Bat	*Artibeus jaimaicensis*	Most common spp on the island	LC
Blossom Bat o Insular Single Leaf Bat	*Monophyllus plethodon*	Second most common spp. Endemic to the Lesser Antilles	LC

Fruit Eating Bats	*Ardops nichollsi* luciae	Regional Endemic	LC
Saint Lucia little yellow-shouldered Fruit Eating Bats	*Sturnira lilium* luciae	Regional Endemic occurring only in Saint Lucia and St. Vincent	LC
Insect eating naked-backed bat	*Pteronotus davyi*	Global	LC
Insect Eating Bat	*Molossus molossus*	Global	LC
Insect Eating Bat	*Tadarida brasiliensis*	Global	LC
fishing bat	*Noctiolio leporinus*	Global	NE
	Brachyphylla cavernarum	Global	NE

Reptiles and Amphibians

Saint Lucia is geographically outstanding and significant for reptiles, with seven endemic species - 53% of indigenous terrestrial species - Saint Lucia anole Anolis luciae, Saint Lucia pygmy gecko Sphaerodactylus microlepis, Saint Lucia fer-de-lance Bothrops caribbaeus, and Saint Lucia thread snake Leptotyphlops bruilei are four of the endemic reptiles that are known for the Venus Road in vary degree of frequency and distribution. There are five endemic subspecies, including the Saint Lucia boa Boa constrictor orophias which is also listed for the Anse La Ray Millet watershed and can aso found occurring in the Venus area.

Figure 17: Saint Lucia thread snake Leptotyphlops bruilei (Photo by Dr. J. Dultary)

Figure 18: Saint Lucia boa Boa constrictor orophias (Photo By Dr. J. Dultary)

Figure 19: Saint Lucia fer-de-lance *Bothrops caribbaeus* (Photo by Bob Williams)

Six (6) known alien reptiles have been have been listed for Saint Lucia. The Anolis wattsi is spreading very rapidly across the island and observed along the Venus road, appears to be capable of displacing the endemic Anolis luciae (Daltry, 2009).

The amphibian list for saint Lucia include only two native species and three (3) alien invasive, all are also listed in the study area and are described by Daltry, 2009 very abundant on Saint Lucia. This includes the Johnstones whistling frog (Eleutherodactylus johnstonei); whereas, the alien amphibians are includes the notorious cane toad, *Bufo marinus*

Figure 20: Cane Toad, *Bufo marinus* (Photo By Dr. J. Dultary)

While only two reptiles are currently shown on the IUCN (2009) Red List as threatened with extinction, almost all of the endemic taxa are in serious decline and meet IUCN's criteria as being globally threatened, including the endemic pygmy gecko (both subspecies), thread snake and fer-delance (Daltry, 2009).

5. CONCLUSSION AND RECOMMENDATIONS

Mitigating the predicted impact on the priority and endangered bird species and the biosecurity management during and after construction to prevent the introduction or increase in the population of alien invasive predator species are the two most important concerns for this ESIA. Ideally, there should no alteration or fragmentation of the existing forests to ensure the conservation of the endangered species, especially the Saint Lucia Parrot, Black finch and Oriole, all listed as endangered species by IUCN. However, the interest of the client has to be taken into consideration and the next best alternative must be considered. The following recommendations are suggested guidelines to mitigate the impact of the road improvement process on the priority species and other endangered fauna.

1. Guidelines for Mitigation of Priority and Endangered Bird Species

The timing in the operation of heavy equipment is necessary to mitigate the impact on endangered and priority bird species, especially the Saint Lucia Parrot, Black finch and Oriole listed in Annex II. Reducing operation during the feeding activity period of birds, 6AM to 8Am and 4PM to 6PM can help reduce stress and displacement of these species, especially in the areas where the road traverse through primary forest areas. Reducing noise level is also necessary during the parrot nesting period, from February to May, of every year. Studies have shown that persistent high noise levels are associated with parrot nest abonnement.

2. Measures to Limit the Threat of Invasive Predators

Invasive predator control measures will be warranted here because of the increase in the invasive predators that may be attracted to the new development in the area. Management of mongoose, rats, dogs, cats and other predators is necessary for the conservation of the priority species.

Biosecurity protocols during construction is necessary to reduce the incidence of invasive alien species, such as rats, mangoes and other pest that can be brought in with heavy equipment, materials ect. The following are some necessary protocols during construction:

- Measures to prevent workers brining in cats, dogs and other potential predator pets during operation phase.
- Careful inspection and when necessary sainting of equipment brought into the site to prevent contamination and spread of pest, invasive and diseases.

- Education, inspection and where necessary sanitizing of worker's personal containers or any other item which can harbour known pest, diseases and invasive.
- Proper waste management in line with existing national laws is paramount in reducing the impact of invasive species, pest and diseases which can impact the conservation of the biodiversity, specifically, the endangered species occurring in the project area. Therefore, waste produced during construction should be carefully managed and disposed according to guidelines established by the Solid Waste Management Authorities in Saint Lucia.

While there is no direct relationship between the proposed road expansion and the presence of feral pigs; indirectly, better access roads can facilitate control of feral pigs. On the other hand, improved road access may also facilitate increase pig farming and chances of pigs becoming feral. Therefore, coordination with the Forestry Department is recommended for public awareness activities with farmers and hunters to manage the spread of feral pigs in the project area.

Annex 1 - International Union for the Conservation of Nature (IUCN) Catagories

Category	Acronym	Description
Extinct	EX	The last remaining member of the species has died, or is presumed beyond reasonable doubt to have died.
Extinct in the wild	EW	Captive individuals survive, but there is no free-living, natural population.
Critically endangered	CR	Faces an extremely high risk of extinction in the immediate future
Endangered	EN	Faces a very high risk of extinction in the near future.
Vulnerable	VU	Faces a high risk of extinction in the medium-term
Conservation Dependent	CD	The following animal is not severely threatened, but the animal must depend on conservation programmes
Near Threatened	NT	May be considered threatened in the near future
Data Deficient	DD	There is inadequate information to make a direct/indirect assessment of risk of extinction based on pop status
Least Concern	LC	No immediate threat to the survival of the species
Not Evaluated	NE	There has been no assessment

Annex II – Status of Birds Species Occurring in the Soufriere Watershed

Common Name	Scientific Name	Status		Priority
Broad-winged Hawk	*Buteo platypterus rivierei*	C	LC	
Saint Lucia Parrot (Jacquot)	***Amazona versicolor***	**C**	**VU**	
Zenaida Dove	*Zenaida aurita aurita*	C	LC	
Mangrove Cuckoo	*Coccyzus minor*	C	LC	

Purple-throated Carib	*Eulampis jugularis***	C	LC	
Antillean Crested Hummingbird	*Orthorhyncus cristatus exilis***	C	LC	
Lesser Antillean Flycatcher	*Myiarchus oberi sanctaeluciae* *	U	LC	
Caribbean Elaenia	*Elaenia martinica martinica* **	C	LC	
Lesser Antillean Pewee (ST. LUCIA PEWEE)	***Contopus oberi***	**C**	**LC**	
Gray Kingbird	*Tyrannus dominicensis vorax*	C	LC	
Gray Trembler	*Cinclocerthia gutturalis macrorhyncha* *	C	LC	
Scaly-breasted Thrasher	*Allenia fusca schwartzi* **	C	LC	
Black-whiskered Vireo	*Vireo altiloquus barbatulus*	C	LC	
St. Lucia Warbler	***Dendroica delicata***	**C**	**LC**	
Bananaquit	*Coereba flaveola martinicana* **	C	LC	
Black-faced Grassquit	*Tiaris bicolor*	C	LC	
ST. LUCIA BLACK FINCH	***Melanospiza richardsoni***	**R**	**EN**	
Lesser Antillean Bullfinch	*Loxigilla noctis sclateri* **	C	LC	
Lesser Antillean Saltator	*Saltator albicollis albicollis* *	C	LC	
Carib Grackle	*Quiscalus lugubris inflexirostris* **	C	LC	
St. Lucia Oriole	***Icterus laudabilis***	**R**	**NT**	

Endemic species appear in bold

*** – Endemic subspecies**

**** – Lesser Antillean regional endemic**

C – Common: often seen or heard in appropriate habitat

U – Uncommon: usually present; may not be seen or heard on every visit to appropriate habitat

R – Rare: present in appropriate habitat, but only in small numbers; seldom seen or heard

Annex III

LIST OF PRIORITY SPECIES FOR SAINT LUCIA

Source: The Status and conservation of Saint Lucia's forest Birds, Toussaint et al 2009

Common name	Latin name	Endemics	Endemics inc. subsp.
Bridled Quail-dove	*Geotrygon mystacea*		
Forest thrush	*Cichlherminia lherminieri*		❖
Great blue heron	*Ardea herodias*		
Grey trembler	*Cinclocerthia gutturalis*		❖
Lesser antillean saltator	*Saltator Saltator albicollis*		❖
Lesser antillean flycatcher	*Myiarchus oberi sanctaeluciae*		❖
Rufous-throated Solitaire	*Myadestes genibarbis*		❖
Semper's warbler	***Leucopeza semperi***	❖	❖
Saint Lucia Amazon	***Amazona versicolor***	❖	❖
Saint Lucia black finch	***Melanospiza richardsoni***	❖	❖
Rufous nightjar	*Caprimulgus rufus otiosus*		❖
Saint Lucia oriole	***Icterus laudabilis***	❖	❖
Saint Lucia pewee	***Contopus oberi***	❖	❖
Saint Lucia warbler	***Dendroica delicata***	❖	❖
House wren	*Troglodytes aedon mesoleucus*		❖
White-breasted Thrasher	*Ramphocinclus brachyurus*		❖

ANNEX IV

REFERENCES

Anthony, D. & Dornelly, A. (2008) St. Lucia. In Wege, D.C. & Anadon-Irizarry, V. (Eds) *Important Bird Areas in the Caribbean: Key Sites for Conservation*. BirdLife Conservation Series No. 15. BirdLife International, Cambridge.

AOU (1998 + supplements) Check-list of North American birds. Seventh edition. Washington, D.C.: American Ornithologists' Union. Downloaded from http://www.aou.org/checklist/north/index.php on 13 November 2009.

BirdLife International (2011) The BirdLife checklist of the birds of the world, with conservation status and taxonomic sources. Version 2. Downloaded 17 November 2011 from http://www.birdlife.org/datazone/species/downloads/BirdLife_Checklist_Version_2.zip [.xls zipped 1 MB]..

Dornelly, A., Whitehead, H., Morton, M.N., Jn Baptiste, T., Regis, R. & Mitchell, N. (2007a) *Report on the 2007 Pilot Study to Evaluate the Feasibility of a Survey to Estimate the Population Size of the Saint Lucia Amazon*. Unpublished Report. Saint Lucia Forestry Department, Union and Durrell Wildlife Conservation Trust, Jersey.

Gilardi, J.D. & John, C.L. (1998) Conservation of the St. Lucia house wren *Troglodytes aedon mesoleucus*: distribution, abundance and breeding biology. *Dodo (Jersey Wildlife Preservation Trust)*, 34, 91-102.

Graveson, R. (2009) *The Classification of the Vegetation of Saint Lucia*. Technical Report to the National Forest Demarcation and Bio-Physical Resource Inventory Project, FCG International Ltd, Helsinki, Finland.

Grimshaw, T. (2005) *A Report from birdtours.co.uk. Saint Lucia, October 23rd to November 6th 2005* [online] http://www.birdtours.co.uk/tripreports/st.lucia/st.lucia4/st-lucia-nov-05.htm

IUCN (2009) *IUCN Red List of Threatened Species. Version 2009.1*. <www.iucnredlist.org>. [Downloaded on 27 October 2009].

John, C.L. (2001) *Attitudes Towards Hunting And The Development Of A National Wildlife Policy In St. Lucia*. Unpublished Report. Saint Lucia Forestry Department, Union.

John, C.L. (2004) *Migrant Bird Records for Saint Lucia, West Indies*. Unpublished Report. Saint Lucia Forestry Department, Union.

Keith, A.R. (1997) *The Birds of Saint Lucia. An Annotated Check-list*. B.O.U. Check-list No. 15. British Ornithologists Union, Peterborough, U.K.

Morton. M.N. (2007b) *Occupancy Estimation Pilot Study 2007: Notes for Surveyors*. Unpublished Report. Durrell Wildlife Conservation Trust, Jersey.

Morton, M.N., Jn Baptiste, T., Whitehead, H., Regis, R., Mitchell, N, Jn Baptiste, L. & Dornelly, A. (2008) *Saint Lucia Amazon Survey 2008: Estimating the Effect on Flying Parrots and of Disturbance Due to Counting on a Population Estimation Method*.Unpubl. Report. Saint Lucia Forestry Department, Union and Durrell Wildlife Conservation Trust, Jersey

Raffaele, H., Wiley, J., Garrido, O., Keith, A. & Raffaele, J. (1998) *A Guide to the Birds of the West Indies*. Princeton University Press, Princeton, New Jersey.

Toussaint, A, John,L, Morton, M. (209) *Status and conservation of Saint Lucia's forest Birds*. Technical Report No. 2 to the National Forest Demarcation and Bio-Physical Resource Inventory Project, FCG International Ltd, Helsinki, Finland.

Toussaint, A 2007. Birds of Saint Lucia, West Indies.

US Fish and Wildlife Service. 2008. Neotropical Migratory Bird Conservation Act: Bird List. Download from http://www.fws.gov/birdhabitat/grants/nmbca/BirdList.shtm on 17 November 2009.

Wege, D.C. & Anadon-Irizarry, V. (Eds) 2008. *Important Bird Areas in the Caribbean: Key Sites for Conservation*. BirdLife Conservation Series No. 15. BirdLife International, Cambridge.

Wiley, J. W., R. S. Gnam, S. E. Koenig, A. Dornelly, X. Galvez, P. E. Bradley, T. White, M. Zamore, P. R. Reillo, and D. Anthony. 2004. Status and conservation of the family Psittacidae in the West Indies. Journal of Caribbean Ornithology 17, 94–154. (Special issue).

Wingate, D. (1969) *A Summary of the Status of the Saint Lucia Parrot,* Amazona versicolor, *and Other Rare Birds of Saint Lucia*. Unpublished Report. International Council for Bird Preservation, Washington, D.C.

Young, R.P., Marsden, S., Jn Baptiste, T., Dornelly, A., Whitehead, H., Young, G., Morton, M. N. et al., A status assessment of the Saint Lucia Amazon, *Amazona versicolor*. In preparation.

ANNEX 1 PHOTOS OF FAUNA FOUND IN STUDY AREA

Photo 1. Mongoose (*Herpestes auropunctatus*)

Photo 2. Jamaican Fruit Bat *(Artibeus jamaicensis)*

Photo 3. Opposum (Didelphis marsupialis)

Photo 4. St. Lucia Warbler or Chic Chic (*Dendroica delicata*)

Photo 6. St. Lucia Anolis (*Anolis luceae*)

Photo 5. St. Lucia Parrot or Jaquot (Amazona versicolor)

Photo 6. St. Lucia Pewee (Contopus oberi)

Photo 7. St. Lucia Boa constrictor (*Constrictor orophias*)

FLORA ASSESSMENT REPORT
OF
ANSE LA RAYE VENUS ROAD PROJECT
ANSE LA RAYE, SAINT LUCIA

2020

By Roger Graveson

Botanist

Executive Summary

Survey Methodology

The area was sampled by traversing on foot along the site for the existing road which included all habitat types within the study area. Plant species at those sites were recorded with particular attention paid to large and dominant trees. In addition the main survey lines in the area were used as transect lines to survey the vegetation to. All plants species observed were noted and included in **ANNEX 1**

General Description of the Study Area

The flora specialist aho undertook the assessment of the flora found along the roadsides between Anse La Raye and Venus, with some familiarity of the area through repeated visits over the last twenty years. Data collected on these field trips enabled the thorough identification of endemic, rare and endangered species found in the area. In addition vegetation classes were assessed using the flora specialist consultant's 2009 report The Classification of the Vegetation of Saint Lucia, part of the

National Forest Demarcation and Bio-physical Inventory Project. This project entailed the detailed surveying of over 200 plot points island-wide and from the results produced a vegetation classification system suited to Saint Lucia.

The study area is limited to vegetation close to the road that runs from Anse La Raye inland to Venus. For several miles the road follows the Grande Riviere valley and then rises quiet steeply away from the valley and up to the farming community of Venus. Elevations start close to sea level and rise to about 300m. Forest cover is generally quite complete and vegetation lush apart from the lowest part of the valley which has been cleared for housing and agriculture and where there are quarries. Small gardens are also found close to the road with rather more intensive farming closer to Venus.

Vegetation analysis using data from three plots along the road determined that lower elevations of the road were covered by **Semi-evergreen Seasonal** Forest transitioning to **Lower Montane Rainforest** at higher elevations. The riparian semi-evergreen seasonal forest was very biodiverse with many rare and locally endangered species present some of which are illustrated in the report. As this vegetation class has largely been cleared for cultivation, Grande Riviere valley which is much less disturbed is an important natural reserve.

The lower montane rainforest roadsides at higher elevations are more disturbed and secondary in nature. However the rare Saint Lucia endemic, *Acalypha elizabethae* is present here.

The floral analysis shows that the sides of the road from Anse La Raye to Venus are very botanically biodiverse with the presence of many species very rare elsewhere in Saint Lucia. This is particularly true of the lower elevations which have a rich riparian semi-evergreen seasonal Forest cover. However the upper elevations are also of interest particularly with the presence of the rare Saint Lucia endemic, *Acalypha elizabethae*.

Thus road construction and improvement should minimize any vegetation clearance so as to safeguard this biodiversity. In addition, this road was an important eco-tourist destination and much of the charm was the closed-in "jungly" nature of the roadsides. Clearance will dramatically reduce this visual impact.

Furthermore tree vegetation is very important at lower elevations as it reduces damage to the road cause by flooding. At higher elevations where the slope on both side of the road is very steep, clearance will result in landslides which in turn will damage the road.

Common sense thus indicates that vegetation clearance is not a good idea and that if the wet and shady nature of the road cause problems with a particular road surface, then that surface should be changed rather than the roadside environment be destroyed.

Table of Contents

1.0 Introduction

The consultant was approached to produce an assessment of the flora found along the roadsides between Anse La Raye and Venus. It is an area the consultant has visited repeatedly over the last twenty years. Data collected on these field trips enabled him to identify endemic, rare and endangered species found in the area. In addition vegetation classes were assessed using the consultant's 2009 report The Classification of the Vegetation of Saint Lucia, part of the National Forest Demarcation and Bio-physical Inventory Project. During this project he surveyed in detail over 200 plot points island-wide and from the results produced a vegetation classification system suited to Saint Lucia.

1.1 Study Area Overview

The study area is limited to vegetation close to the road that runs from Anse La Raye inland to Venus. For several miles the road follows the Roseau valley and then rises quiet steeply away from the valley and up to the farming community of Venus. Elevations start close to sea level and rise to about 300m. Forest cover is generally quite complete and vegetation lush apart from the lowest part of the valley which has been cleared for housing and agriculture and where there are quarries. Small gardens are also found close to the road with rather more intensive farming closer to Venus (Fig. 1).

2.0 Floristic Analysis

2.1 Vegetation Classes

Three plots were surveyed during the consultant's vegetation classification survey, two (Plots 104 and 105) in the river valley closer to Anse La Raye (Fig.1) and one (Plot 106).on the higher slopes closer to Venus (Fig. 2 and Graveson 2009).

Plots 104 and 105 were between 20 metres and 50 meters in elevation. The results were amalgamated as the plots are quite geographically close and botanically similar (Table 1).

Figure 1 Western Part of Road, Showing Position of Plots 104 And 105

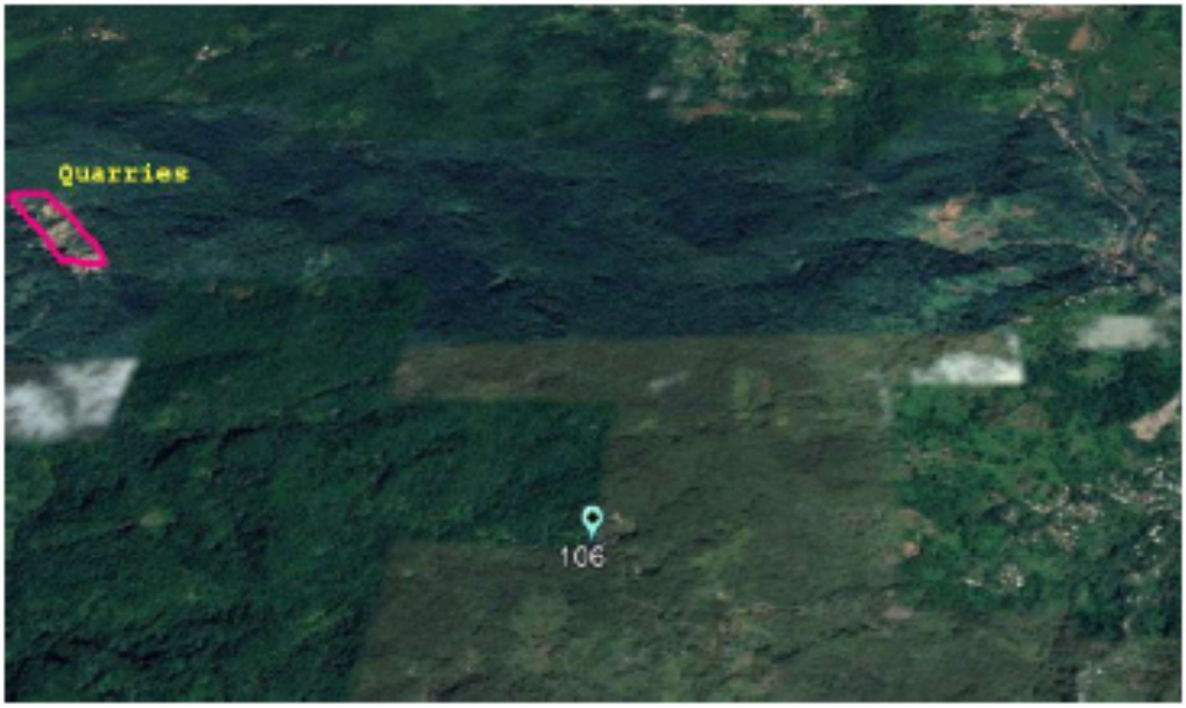


Figure 2. Plot 106 Closer to Venus/Millet Communities.

Two methods were used to analyse vegetation present and assign vegetation classes. One approach was a Two-way Indicator Species Analysis (TWINSPAN) of tree presence and absence. TWINSPAN was originally devised as a Fortran program by Hill (1979). It has become one of the most popular hierarchical clustering techniques for classifying species and samples (plots), organising them into an ordered two-way table or dendrogram (tree diagram). The second approach was a Manual Species and Forest Association Analysis which is explained in detail in the 2009 report. Both approaches led to almost identical conclusions and resulted in the report's vegetation classification system.

In Saint Lucia there are three main vegetation classes:

- **Deciduous Seasonal Forest** is defined as deciduous because the taller trees tend to lose all their leaves in most dry seasons, although the smaller trees and shrubs are evergreen. Its overall appearance during a normal dry season is of a more or less leafless canopy. There is no moss or cover of ground ferns. It reaches to the coast and as high as 700m on Petit Piton
- **Semi-evergreen Seasonal Forest** occupies the zone between Deciduous Seasonal Forest and Lower Montane Rainforest. It is characterized by upper canopy trees with rather thin,

often broad, and quite often compound leaves, which may lose some, but not all, of their leaves during a dry spell. Elevation ranges from almost sea-level in ravines to the summit of Gros Piton.

- **Lower Montane Rainforest** merges with Semi-evergreen Seasonal Forest at lower elevations. Trees are evergreen because there is no water deficit most years in any month. Tree ferns and Heliconias are often present along with a fern and herbaceous ground. Epiphytes are often common.

Analysis of the plot data revealed that **Semi-evergreen Seasonal Forest** is present along the river valley. This is typically found close to lowland river valleys (riparian vegetation) and has been destroyed in most parts of Saint Lucia particularly by intensive banana farming. Anse la Raye valley, although somewhat disturbed by small scale agriculture, has managed to retain its biodiverse riparian vegetation right up to the side of the road. Thus this valley is an important reserve of this beautiful lush vegetation class, of which so much has been destroyed in Saint Lucia.

Table 1 Data from Plots 104 and 105.

Family	Botanical Name	Local Name	Habit	Status
Anacardiaceae	*Spondias mombin*	Hog plum	Tall tree	Naturalized
Arecaceae	*Aiphanes minima*	Gwi-gwi	Palm tree	W. I. endemic
Faboideae	*Andira sapindoides*	Anjlen	Tall tree	Indigenous
Araceae	*Anthurium cordatum*	Sidjinn	Herb	Indigenous
Burseraceea	*Bursera simaruba*	Gonmyé modi	Tall tree	Indigenous
Mimosoideae	*Calliandra tergemina*	Bwa patat.	Shrub	Indigenous
Calophyllacea	*Calophyllus antillana*	Galba	Tree	W. I. endemic
Moraceae	*Castilla elastica*	Rubber tree	Tree	Naturalized
Urticaceae	*Cecropia schreberiana*	Bwa kannon	Tall tree	W. I. endemic
Sapotaceae	*Chrysophyllum argenteum*	Bwi. Bwi kayamit.	Small tree	Indigenous
Polygonaceae	*Coccoloba swartzii*	Bwa lanmowi.	Tee	Indigenous
Arecaceae	*Cocos nucifera*	Koko. Coconut	Palm tree	Cultivated
Boraginaceae	*Cordia collococca*	Sip	Tree	Indigenous
Boraginaceae	*Cordia sulcata*	Sip blan	Tall tree	W. I. endemic
Sapindaceae	*Cupania americana*		Tree	Indigenous
Myrtaceae	*Eugenia oerstediana*	Bwa di bas gwi	Tall tree	Indigenous
Malvaceae	*Guazuma ulmifolia*	Bwa lonm	Tree	Indigenous
Heliconiaceae	*Heliconia caribaea*	Balizyé	Herb	W. I. endemic
Mimosoideae	*Inga ingoides*	Kakoli	Tall tree	Indigenous

Mimosoideae	*Inga laurina*	Pwa dou	Tall tree	Indigenous
Poaceae	*Lasiacis divaricara*	Ti banbou.	Bamboo-like	Indigenous
Anacardiaceae	*Mangifera indica*	Mango	Tall tree	Naturalized
Araceae	*Monstera andersonii*		Vine	Indigenous
Myrtaceae	*Myrcia deflexa*	Bwa kwéyòl	Tree	Indigenous
Myrtaceae	*Myrcia splendens*	Bwa di bas.	Small tree	Indigenous
Poaceae	*Olyra latifolia*		Bamboo-like	Indigenous
Rubiaceae	*Palicourea*	Bwa kilibwi	Small tree	Indigenous
Myrtaceae	*Pimenta racemosa*	Bwaden. Bay leaf.	Tall tree	Indigenous
Piperaceae	*Piper dilatatum*	Malenbé. .	Shrub	Indigenous
Polygalaceea	*Securidaca diversifolia*	Easter vine	woody vine	Indigenous
Bignoniaceae	*Tabebuia heterophylla*	White Cedar.	Tall tree	W. I. endemic
Apocynaceae	*Tabernaemontana citrifolia*	Bwa let	Small tree	W. I. endemic
Malvaceae	*Theobroma cacoa*	Cocoa. Kako.	Tree	Cultivated

Key. W. I. endemic = West Indian endemic

Plot 3 was at a much higher elevation (270 m.) and on steep slopes away from the river valley (Fig 20. Analysis of the data revealed that the vegetation class present is Lower Montane Rainforest, typically found in the forest reserve. However it was quite disturbed with evidence of considerable past and present farming and most of the trees were typical of secondary lower montane rainforest

Table 2 Data from Plot 106

Family	Botanical Name	Local Name	Habit	Status
Malpighiaceae	*Byrsonima spicata*	Bwa tan	Tree	Indigenous
Urticaceae	*Cecropia schreberiana*	Bwa kannon	Tall tree	W. I. endemic
Polygonaceae	*Coccoloba ascendens*		Woody vine	Indigenous
Arecaceae	*Cocos nucifera*	Koko. Coconut.	Palm tree	Cultivated
Cyathaceae	*Cyathea arborea*	Fwijè	Tree fern	Indigenous
Cyathaceae	*Cyathea grandifolia*	Fwijè	Tree fern	L. A. endemic
Chrysobalanaceae	*Licania leucosepala*		Tree	Indigenous
Faboideae	*Lonchocarpus*	Savonnèt gwan	Tree	Indigenous
Melastomataceae	*Miconia furfuracea*	Bwa kòt	Small tree	L. A. endemic
Melastomataceae	*Miconia mirabilis*	Bwa kòt	Small tree	Indigenous
Melastomataceae	*Miconia racemosa*		Shrub	Indigenous
Myrtaceae	*Myrcia deflexa*	Bwa kwéyòl	Small tree	Indigenous
Lauraceae	*Nectandra membranacea*	Lowyé sann	Tall tree	Indigenous

Family	Botanical Name	Local Name	Habit	Status
piperaceae	*Piper dilatatum*	Malenbé	Shrub	Indigenous
Sapotaceae	*Pouteria multiflora*	Pennépis	Tall tree	Indigenous

Arecaceae	*Prestoea acuminata*	Palmis	Palm tree	W. I. endemic
Malvaceae	*Sterculia caribaea*	Mako kochon	Tall tree	L. A. endemic
Symplocaceae	*Symplocos martinicensis*	Bwa blé. Zolivyé.	Tree	Indigenous
Myrtaceae	*Syzygium jambos*	Ponm woz	Tree	Naturalized
Orchidaceae	*Vanilla planifolia*	Vanilla	Vine	Cultivated

Key. W. I. Endemic = West Indian endemic. L.A. endemic = Lesser Antillean endemic

In summary, roadsides at lower elevations were covered by a biodiverse riparian **Semi-evergreen Seasonal Forest** transitioning to a secondary **Lower Montane Rainforest** at higher elevations. No Deciduous Seasonal Forest (dry forest) was observed along the roadsides.

2.2 Species of Interest

Species of interest comprise endemic species, very rare and endangered species. As explained above Semi-evergreen Seasonal Forest is a threatened vegetation class in Saint Lucia. Thus several species found in the Grande Riviere Valley are of interest. Details of all species can be seen on the consultant's website, www.saintlucianplants.com

This valley is very rich in epiphytic orchids with approximately 20 species present. Neglected stands of citrus trees are extremely rich in epidendrums and other orchid species. *Ionopsis utricularioides* is an extremely rare orchid found close to La Sikwi Sugar Mill 9 (Fig. 3).

Figure 2 *Ionopsis utricularioides.*

Figure 4 *Andira inermis*, Anjlen.

Andira inermis is a beautiful tree found very close to lowland rivers. It is found in Grande Riviere Valley but is now rare in Saint Lucia due to habitat loss and exploitation for timber (Fig. 4 and Cover Photo).

Figure 5 *Eugenia oerstediana*, Bwa di Bas Gwi.

A tall Myrtaceae tree common in Grande Riviere Valley, very rare elsewhere (Fig. 5).

Figure 6 *Monstera andersonii*, Swiss Cheese Plant.

Monstera andersonii is a very common vine in Grande Riviere valley , very rare elsewhere in Saint Lucia (Fig. 6). It should not be confused with a similar invasive vine Epipremnum pinnatum which has yellow and green leaves.

Figure 7 *Olyra latifolia.*

Several bamboo-like grasses are found along the road. Olyra latifolia ia rare species. (Fig.7).

Figure 8 *Stigmaphyllon puberum.*

Stigmaphyllon puberum is an extremely rare woody vine in Saint Lucia but is not uncommon close to the Grande Riviere River in the quarry area. Fig. 8).

Figure 9 *Sicydium tamnifolium.*

Sicydium tamnifolium is an extremely rare delicate vine, found on roadside cliffs closer to Venus (Fig 9).

A rare Saint Lucia endemic Acalypha elizabethae, is also found on roadside cliffs closer to Venus. This species thrives in semi-open wet spots (Fig. 10).

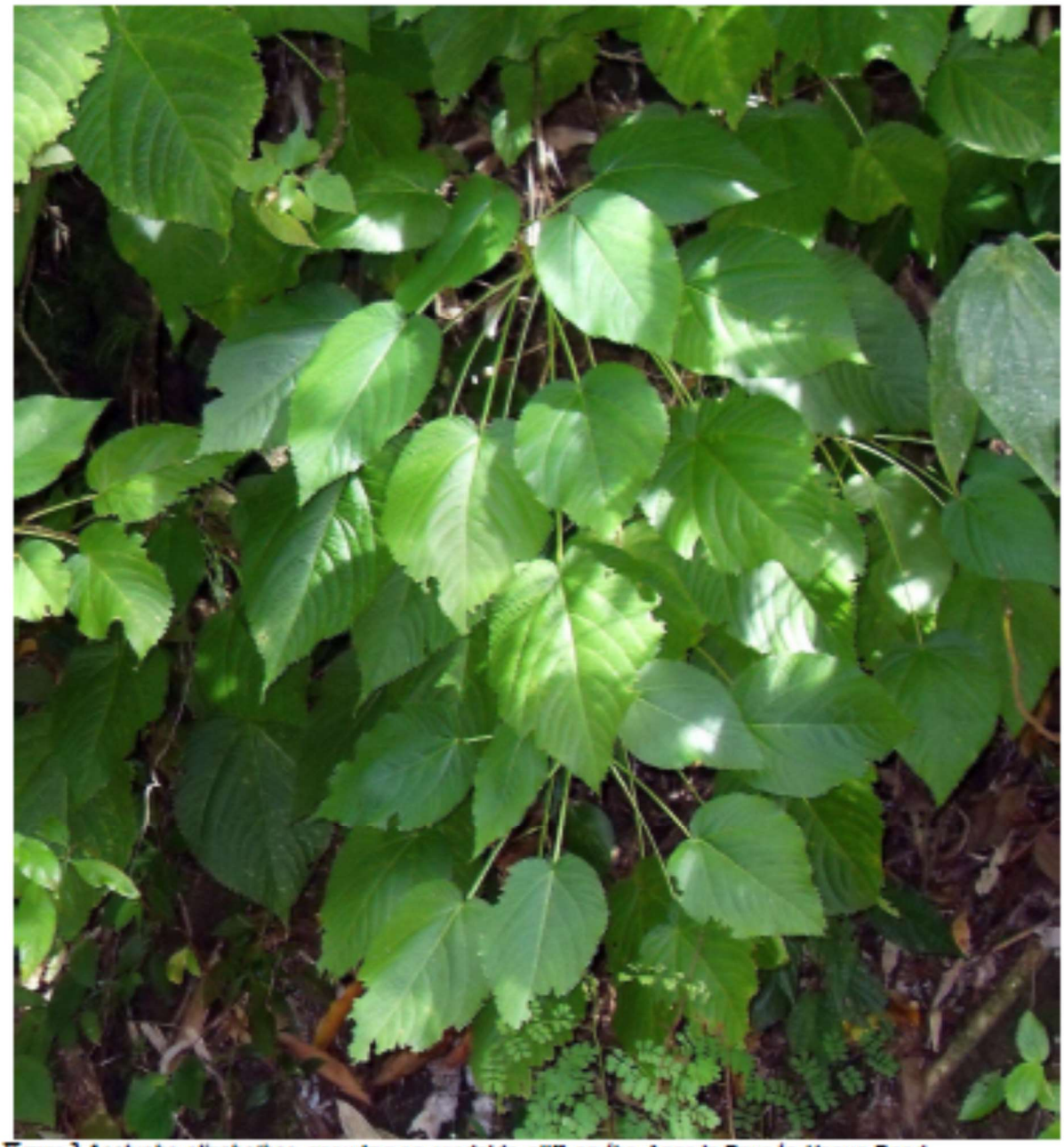


Figure 3 ***Acalypha elizabethae*** **growing on roadside cliff on the Anse la Raye to Venus Road.**

2.3 Species of Conservation Concern

The roadside is rich in epiphytic orchids some of which are very rare and are listed in Table 3. Only some tree species support epiphytic orchids and where orchid growth is observed that tree should be conserved when possible.

Any specimens of the very rare endemic Acalypha *elizabethae* should be conserved, along with the other rare woody species listed in Table 3.

Table 3. Species of Conservation Concern.

Family	Botanical Name	Habit	Status
Araceae	*Monstera andersonii*	Vine	Indigenous
Cucurbitaceae	*Sicydium tamnifolium*	Terrestrial herb	Indigenous
Euphorbiaceae	*Acalypha elizabethae*	Shrub	Saint Lucian Endemic
Faboideae	*Andira sapindoides*	Tree	Indigenous
Malpighiaceae	*Stigmaphyllon puberum.*	Vine	Indigenous
Myrtaceae	*Eugenia oerstediana*	Tree	Indigenous
Orchidaceae	*Epidendrum nocturnum*	Epiphytic herb	Indigenous
Orchidaceae	*Epidendrum strobiliferum*	Epiphytic herb	Indigenous
Orchidaceae	*Ionopsis utricularioides*	Epiphytic herb	Indigenous
Poaceae	*Olyra latifolia*	Terrestrial herb	Indigenous

Rare terrestrial herbs, *Olyra latifolia* and *Sicydium tamnifolium* cannot be conserved but will appear where suitable natural conditions are maintained.

It will be essential to have a field botanist on hand to teach the construction team on the identification of these species.

3.0 Recommendations

The floral analysis shows that the sides of the road from Anse La Raye to Venus is very botanically biodiverse with the presence of many species very rare elsewhere in Saint Lucia. This is particularly true of the lower elevations which have a rich riparian semi-evergreen seasonal forest cover. However the upper elevations are also of interest particularly with the presence of the rare Saint Lucia endemic, Acalypha elizabethae.

Thus road construction and improvement should minimize any vegetation clearance so as to safeguard this biodiversity. In addition, this road was an important eco-tourist destination and much of the charm was the closed-in "jungly" nature of the valley. Clearance will dramatically reduce this visual impact.

Furthermore tree vegetation is very important at lower elevations as it reduces damage to the road cause by flooding. At higher elevations where the slope on both side of the road is very steep, clearance will result in landslides which in turn will damage the road.

Common sense thus indicates that vegetation clearance is not a good idea and that if the wet and shady nature of the road cause problem with a particular road surface, then that surface should be changed rather than the roadside environment be destroyed.

ANNEX 1

LIST OF PLANTS OBSERVED IN THE STUDY AREA

BOTANICAL NAMES	Vernacular Names	FAMILY	FORM	Ethobotanical Information	STATUS
Aegiphila martinicensis	Bwa Kabuit	VERBENACEAE	Shrub	Medicinal	Common
Anthurium grandifolium	Wild anthurium	ARACEAE	Herb	Ornamental	Scattered
Artocarpus altilis	Bwapen, Breadfruit	MORACEAE	Tree	Food, medicinal, timber	Scattered
Bambusa nana	Dwaf Bamboo	POACEAE	Shrub	Fodder	Scattered
Bambusa vulgaris	Bambou, Bamboo	POACEAE	Tree	Multipurpose, arts, crafts	Scatered
Blechum brownei	St. John's bush	ACANTHACEAE	Herb	Medicinal	Scattered
Brysomina spicata	Bwa tan ti	MALPIGHIACEAE	Tree	Tanning leather, bird food, charcoal	Scattered
Burvera simaruba	Gommye modi	BURSERACEAE	Tree	Medicinal	Common
Carica papaya	Paw Paw, Papay	CARICACEAE	Tree	Food, Medicine	Common
Casearia guianensis	Bwa Koko Kawet	FLACOURTIACEAE	Tree	Medicinal, charcoal	Common
Cecropia peltata	Bwa Kannon	MORACEAE	Tree	Craft, medicine,	Common
Chrysophyllum argenteum	Bwi	SAPOTACEAE	Tree	Food	Common
Cissus obavata	Lyann godmo	VITACEAE	Vine	Arts, crafts, Baskets	Common
Citrus sinensis	Orange, nowange	RUTACEAE	Tree	Edible, Food, Medicine	Scattered
Citharexylum fruticosum	Bwa Koklet, Bwa Leza	VERBENACEAE	Shrub	Fuel	Common
Citharexylum spinosum	Bwa Cocklet	VERBENACEAE	Shrub	Medicinal, Fuel	Common
Coccoloba swartzii	Bwa lamowi	POLYGONACEAE	Tree	Fuel	Common
Cocos nucifera	Coconut, Koko	PALMAE	Tree	Food, Water, Housing, Multipurpose	Abundant
Colocasia esculenta	Dasheen	ARACEAE	Herb	Food	Scattered
Cordia collococca	Sip	BORAGINACEAE	Tree	Fuel	Common
Cordia martinicensis	Maho mwe	BORAGINACEAE	Shrub	Medicinal	Common
Commelina diffusa	Water grass, Zeb gwa	COMMELINACEAE	Herb	Fodder, Medicinal	very common
Cornutia pyramidata	Bwa Kasav	VERBENACEAE	Tree	Charcoal	Common
Daphnopsis Americana	Maho Pinam	THYMELEACEAE	Tree	Rope,	Common
Dioscorea alata	Banja, wild yam	DIOSCOREACEAE	Liane	Food, Medicine	Common
Epidendrum ciliare	Orchid	ORCHIDACEAE	Herb	Ornamental	Scattered
Epidendrum secundum	Orchid	ORCHIDACEAE	Herb	Ornamental	Scattered
Erythrina corallodendrum	Immortelle	FABACEAE	Tree	Ornamental, Boundary Mark	Scattered
Eupatorium odoratum	Christmas Bush, Flewi Nwel	ASTERACEAE	Herb	Medicinal	Common
Ficus citrifolia	Fije	MORACEAE	Tree	Bird food	Common
Gouania lupuloides	Liane Savon, Chew Stick	RHAMNACEAE	Liane	Tooth brush, Soap	Common
Heliconia caribaea	Balize	HELICONIACEAE	Hebacious shrub	Ornamental housing, food wrap	Common

Heliconia sp	Wild banana, Balize	HELICONIACEAE	Hebacious shrub	Ornamental, housing, food wrap	Scattered
Inga ingoides	Kakoli	MIMIMOSACEAE	Tree	Food , Charcoal	
Inga laurina	Pwa Don	MIMOSACEAE	Tree	Food, Charcoal	Common
Ipomoea indica	Liane Douse	CONVOLVULACEAE	Vine	Fodder	Abundant
Guazuma ulmifolia	Bwa lonm	STERCULIACEAE	Tree	Fuel	Scattered
Lantana camara	Jwof Fle	VERBENACEAE	Shrub	Medicinal, Ornamental	Common
Lasiacis divaricata	Ti Bambou,	GRAMINEAE	Shrub	Fodder	Scattered
Lonchocarpus pentaphyllus	Savonette gwan fey	FABACEAE	Tree	Charcoal, Soap	Common
Mangifera indica	Mango	ANACARDIACEAE	Tree	Food, Charcoal, Medicinal	Common
Mimosa pudica	Sensitive plant Myhont	MIMOSACEAE	Herb	Medicinal	Scattered
Miconia cornifolia	Bwa Kot	MALASTOMATACEAE	Tree	Fuel	Scattered
Musa spp.	Banana	MUSACEAE	Herb	Multipurpose, Food, Paper, Rope, dye	Common
Neurolaena lobata	Zèb-a-Pik	ASTERACEAE	Herb	Insecticidal, Medicinal	Scattered
Ocotea leucoxylon	Laurier mabre	LAURACEAE	Tree	Timber	Scattered
Odontonema nitidum	Chapantye gwan bwa	ACANTHACEAE	Herb	Medicinal	Common
Passiflora laurifolia	Pomme de liane	PASSIFORACEAE	Liane	Food, Arts and craft	Scattered
Pilea semidentata	Zotti Bemi	URTICACEAE	Herb		Common
Pimenta racemosa	Bay leaf, Bwa den	MYRTACEAE	Tree	Medicinal	Scattered
Piper dilatatum	Malambay, Bwa Mal Lestomak	PIPERACEAE	Shrub	Medicinal, Baths	Common
Piper glabrescens	Malambay, Bwa Mal Lestomak	PIPERACEAE	Shrub	Medicinal	Scattered
Pisonia fragrans	Mapou	NYCTAGINACEAE	Tree	Charcoal, Bird feed	Abundant
Polypodium aureum	Fern	POLYPODIACEAE	Herb	Ornamental	Common
Polypodium polypodioides	Fern	POLYPODIACEAE	Herb	Ornamental	Common
Psidium guajava	Guava, Gwijav	MYRTACEAE	Shrub	Food, Medicinal, Fuel	Scattered
Scleria pterota	Zeb a kouto, Razor grass	CYPERACEAE	Herb		Scattered
Securidaca diversifolia	Lyann Pak	POLYGONACEAE	Vine	Ornamental	Common
Simaruba amara	Bwa Blan	SIMARUBACEAE	Tree	Timber	Scattered
Solanum torvum	Belanjeen Djab, Wild Egg Plant	SOLANACEAE	SHRUB	Food, Grafting base for egg plant	Common
Spondias mobin	Momben, Hog Plum	ANACARDIACEAE	Tree	Food, Medicinal	Scattered
Stachytarpheta jamaicensis	Ven Venn-Latjèwat	VERBENACEAE	Herb	Ornamental, Medicinal	Common
Tabernaemontana citrifolia	Bwa Lèt	APOCYNACEAE	Tree	Medicinal	Common
Theobroma cacao	Cocoa	STERCULIACEAE	Tree	Edible, Chocolate, shampoo, vinegar	Common
Urena sinuata	Piquant Cousin	MALVACEAE	Herb	Medicinal	Common
Xanthosoma sagittifolium	Chou, Calalou, Eddoes, Tannia	ARACEAE	Herb	Food	Common
Zanthoxylum caribaeum	Lepinni wouj	RUTACEAE	Tree	Arts, Craft, Charcoal, Housing	Common

Zanthoxylum martinicense	Lepinni	RUTACEAE	Tree	Arts, Craft, Charcoal, Housing	Abundant

APPENDIX 5

LIST OF PLANTS OBSERVED IN THE STUDY AREA

BOTANICAL NAMES	Vernacular Names	FAMILY	FORM	Ethobotanical Information	STATUS
Aegiphila martinicensis	Bwa Kabwit	VERBENACEAE	Shrub	Medicinal	Common
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Bambusa nana	Dwaf Bamboo	POACEAE	Shrub	Fodder	Scattered
Bambusa vulgaris	Bambou, Bamboo	POACEAE	Tree	Multipurpose, arts, crafts	Scatered
Blechum brownei	St. John's bush	ACANTHACEAE	Herb	Medicinal	Scattered
Brysomina spicata	Bwa tan si	MALPIGHIACEAE	Tree	Tanning leather, bird food, charcoal	Scattered
Bursera simaruba	Gonmye modi	BURSERACEAE	Tree	Medicinal	Common
Carica papaya	Paw Paw, Papay	CARICACEAE	Tree	Food, Medicine	Common
Casearia guianensis	Bwa Koko Kawet	FLACOURTIACEAE	Tree	Medicinal, charcoal	Common
Cecropia peltata	Bwa Kannou	MORACEAE	Tree	Craft, medicine,	Common
Chrysophyllum argenteum	Bwi	SAPOTACEAE	Tree	Food	Common
Cissus obavata	Lyenn godmo	VITACEAE	Vine	Arts, crafts, Baskets	Common
Citrus sinensis	Orange, zowange	RUTACEAE	Tree	Edible, Food, Medicine	Scattered
Citharexylum fruticosum	Bwa Koklet, Bwa Leza	VERBENACEAE	Shrub	Fuel	Common
Citharexylum spinosum	Bwa Cocklet	VERBENACEAE	Shrub	Medicinal, Fuel	Common
Coccoloba swartzii	Bwa lanmowi	POLYGONACEAE	Tree	Fuel	Common

Cocos nucifera	Coconut, Koko	PALMAE	Tree	Food, Water, Housing, Multipurpose	Abundant
Colocasia esculenta	Dasheen	ARACEAE	Herb	Food	Scattered
Cordia collococca	Sip	BORAGINACEAE	Tree	Fuel	Common
Cordia martinicensis	Maho mwe	BORAGINACEAE	Shrub	Medicinal	Common
Commelina diffusa	Water grass, Zeb gwa	COMMELINACEAE	Herb	Fodder, Medicinal	very common
Cornutia pyramidata	Bwa Kasav	VERBENACEAE	Tree	Charcoal	Common
Daphnopsis Americana	Maho Piman	THYMELEACEAE	Tree	Rope,	Common
Dioscorea alata	Banja, wild yam	DIOSCOREACEAE	Liane	Food, Medicine	Common
Epidendrum ciliare	Orchid	ORCHIDACEAE	Herb	Ornamental	Scattered
Epidendrum secundum	Orchid	ORCHIDACEAE	Herb	Ornamental	Scattered
Erythrina corallodendrum	Immortelle	FABACEAE	Tree	Ornamental, Boundary Mark	Scattered
Eupatorium odoratum	Christmas Bush, Flewi Nwel	ASTERACEAE	Herb	Medicinal	Common
Ficus citrifolia.	Fije	MORACEAE	Tree	Bird food	Common
Gouania lupuloides	Liane Savon, Chew Stick	RHAMNACEAE	Liane	Tooth brush, Soap	Common
Heliconia caribaea	Balize	HELICONIACEAE	Hebacious shrub	Ornamental housing, food wrap	Common
Heliconia sp	Wild banana, Balize	HELICONIACEAE	Hebacious shrub	Ornamental, housing, food wrap	Scattered
Inga ingoides	Kakoli	MMIMOSACEAE	Tree	Food , Charcoal	
Inga laurina	Pwa Dou	MIMOSACEAE	Tree	Food, Charcoal	Common
Ipomoea indica	Liane Douse	CONVOLVULACEAE	Vine	Fodder	Abundant
Guazuma ulmifolia	Bwa lonm	STERCULIACEAE	Tree	Fuel	Scattered
Lantana camara	Jiwof Fle	VERBENACEAE	Shrub	Medicinal, Ornomental	Common

Lasiacis divaricata	Ti Bambou,	GRAMINEAE	Shrub	Fodder	Scattered
Lonchocarpus pentaphyllus	Savonette gwan fey	FABACEAE	Tree	Charcoal, Soap	Common
Mangifera indica	Mango	ANACARDIACEAE	Tree	Food, Charcoal, Medicinal	Common
Mimosa pudica	Sensitive plant Myhont	MIMOSACEAE	Herb	Medicinal	Scattered
Miconia cornifolia	Bwa Kot	MALASTOMATACEAE	Tree	Fuel	Scattered
Musa spp.	Banana	MUSACEAE	Herb	Multipurpose, Food, Paper, Rope, dye	Common
Neurolaena lobata	Zèb-a-Pik	ASTERACEAE	Herb	Insecticidal, Medicinal	Scattered
Ocotea leucoxylon	Laurier mabre	LAURACEAE	Tree	Timber	Scattered
Odontonema nitidum	Chapantye gwan bwa	ACANTHACEAE	Herb	Medicinal	Common
Passiflora laurifolia	Pomme de liane	PASSIFORACEAE	Liane	Food, Arts and craft	Scattered
Pilea semidentata	Zotti Beni	URTICACEAE	Herb		Common
Pimenta racemosa	Bay leaf, Bwa den	MYRTACEAE	Tree	Medicinal	Scattered
Piper dilatatum	Malambay, Bwa Mal Lestomak	PIPERACEAE	Shrub	Medicinal, Baths	Common
Piper glabrescens	Malambay, Bwa Mal Lestomak	PIPERACEAE	Shrub	Medicinal	Scattered
Pisonia fragrans	Mapou	NYCTAGINACEAE	Tree	Charcoal, Bird feed	Abundant
Polypodium aureum	Fern	POLYPODIACEAE	Herb	Ornamental	Common
Polypodium polypodioides	Fern	POLYPODIACEAE	Herb	Ornamental	Common
Psidium guajava	Guava, Gwijav	MYRTACEAE	Shrub	Food, Mrdicinal, Fuel	Scattered
Scleria pterota	Zeb a kouto, Razor grass	CYPERACEAE	Herb		Scattered
Securidaca diversifolia	Lyenn Pak	POLYGONACEAE	Vine	Ornamental	Common
Simaruba amara	Bwa Blan	SIMARUBACEAE	Tree	Timber	Scattered

Solanum torvum	Belanjenn Djab, Wild Egg Plant	SOLANACEAE	SHRUB	Food, Grafting base for egg plant	Common
Spondias mobin	Mauben, Hog Plum	ANACARDIACEAE	Tree	Food, Medicinal	Scattered
Stachytarpheta jamaicensis	Ven Venn-Latjéwat	VERBENACEAE	Herb	Ornamental, Medicinal	Common
Tabernaemontana citrifolia	Bwa Lét	APOCYNACEAE	Tree	Medicinal	Common
Theobroma cacao	Cocoa	STERCULIACEAE	Tree	Edible, Chocolate, shampoo, vinegar	Common
Urena sinuate	Piquant Cousin	MALVACEAE	Herb	Medicinal	Common
Xanthosoma sagittifolium	Chou, Calalou, Eddoes, Tannia	ARACEAE	Herb	Food	Common
Zanthoxylum caribaeum	Lepinni wouj	RUTACEAE	Tree	Arts, Craft, Charcoal, Housing	Common
Zanthoxylum martinicense	Lepinni	RUTACEAE	Tree	Arts, Craft, Charcoal, Housing	Abundant

APPENDIX 6

STRUCTURED QUESTIONS QUESTIONNAIRE FOR THE SOCIAL IMPACT SURVEY—AFFECTED PERSONS & KEY INFORMANTS

QUSTIONNAIRE OF PROJECT AFFECTED PERSON

QUESTIONNAIRE FOR THE PROPOSED REHABILITATION OF THE VANARD/VENUS/ANSE LA RAYEACCESS ROAD - PROJECT AFFECTED PERSONS

Proposed Project

The Department of Infrastructure is proposing to repair the damaged section of the Vanard/Venus/Anse La Raye road. This questionnaire is administered to collect and collate views of project affected persons regarding the proposed project in order to comply with the requirements of the need for project ESIA.

General Information

1. Enumerator's name …….

2. Respondent's name …….

3. Date of Interview …….

4. Location …….

Demographic Data

6. Head of household name ……

7. Age of head of household ……

8. Sex: Male…….. Female……..

9. Occupation ……

10. Religion ……

11. Total household members ……

12. How long have you lived in the area ……

13. How did you acquire your parcel of land?

    a. Purchase …….
    b. Inheritance ……..
    c. Communal …….
    d. Government ……
    e. Other …….

14. What is your LRTP number ……..

15. Size of plot …….

16. What is the main source of income ……..

Education level	**number of members**
a. Primary	……..
b. Secondary	……..
c. College / University	……..

How far from your residence is the nearest

- Kindergarten …….
- Infant School ……
- Primary School ……
- College …….

<u>Public Health</u>

State the type of diseases experience in your household and frequency of occurrence

Diseases	**Monthly**	**Seasonally**	**Annually**
a) Dengue …….	……		……
b) Asthma ……	……		……
c) Eye Infection	……	……	……
d) Skin disease	……	……..	……
e) AIDS (HIV)	……..		……
f) Ulcers	……	……..	……
g) Pneumonia	…….	…….	……
h) Others/ specify…….		…….	…….

Where do you go for health assistance and please indicated why?

a) Hospital (specify) ……
b) Dispensary (specify) ……
c) Clinic (specify) ……
d) Traditional herbs (source) ……
e) Others (specify) ……

How far away is the health facility located from your residence? ……

What concerns do you have the rehabilitation of the Vanard/Venus/Anse La Raye road on Community Health?

…….

……..

……..

Housing Form

What form of housing do you live in?

a) Permanent (……)
b) Semi-permanent (……)
c) Temporary (……)

What concerns do you have on the rehabilitation of the Vanard/Venus/Anse La Raye Road on your form of housing?

……..

……..

……..

Agriculture Production

Crop	Subsistence/sale	Production	Acreage	Unit price
Dasheen				
Yams				
Plantain				
Bananas				
Vegetables				
Fruits (specify				
Potatoes				
Other (specify)				

What concerns do you have from the rehabilitation of the Vanard/Venus/Anse La Raye Road on agricultural production?

……..

……

……

Land Tenure System

Under what type of tenure do you use / hold this land? Please tick below

a) Freehold (registered) (……..)
b) Freehold (unregistered) (……..)
c) Leasehold (……..)
d) Tenancy (……,…….)
e) Customary/communal (……,…)
f) Do not know (……,…)

What concerns do you have from the rehabilitation of the Vanard/Venus/Anse La Raye Road on land tenure system and prices?

……

……

……

……

Livestock Production and Composition

Type	Number	Purpose (subsistence/sale)	Income (per year)
Cows			
Sheep			
Goats			
Pigs			
Rabbits			
Poultry			
Others (specify)			

What impacts do you anticipate from the rehabilitation of the Vanard/Venus/Anse La Raye Road on local livestock production?

……

……..

……..

Compensation

Some of your land and property may be affected by the proposed road project. Please list the items that you should be compensated for? List them below

1) …….
2) …….
3) …….

What is your preferred mode of compensation for your fixed asset such as land?

a) Cash value (…….)
b) Land for land (…….)
c) Partly cash and partly land (…….)
d) Other (please specify (…….)

If you choose land as a mean of compensation please list the areas where you prefer to be resettled

a) ……
b) ……..
c) ……..

Date: ……. **Signature**: ……

QUESTIONNAIRE OF KEY INFORMANTS

Key Informants - VANARD VENUS ANSE LA RAYE ROAD

The Department of Infrastructure is proposing to upgrade the Vanard to Anse La Raye road. This questionnaire is administered to collect and collate views of stakeholders regarding the proposed project in order to comply with the requirements of the need for ESIA report.

Lead Agency: ……..

Name: ……..

Designation ……

Date ……

1. Suggest areas of possible collaboration with the project proponent Department of Infrastructure of the proposed upgrade of the Vanard to Anse La Raye Road.

……

……

……

……

2. Are there policy and legal links of your institution with the proposed project if any……

……

……

……

3. Do you perceive any potential conflicts that could emerge between your institution and the proposed project? If yes, give details……

……

……

……

4. In your opinion, what benefits does your institution stand to reap from the proposed project?

……

……

……

5. What are the possible impacts from the proposed project that are likely to affect you institution adversely? ……

……

……

……

6. What would you propose as measures to mitigate the above impacts? …….

……

……

……

7. Please make any other comments that you may feel are relevant in relation to the proposed road development project. ……

……

……

……

8. I / We approve the proposed project (Reasons) ……

……

……

……

9. I / We approve do not approve the proposed project (Reasons) ……

……

……

……

APPENDIX 7

SOCIAL SURVEY RESULTS

SOCIAL SURVEY RESULTS

Distance of health facility from residence

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 100 meters	1	2.6	2.6	2.6
	201 to 300 meters	1	2.6	2.6	5.1
	301 to 400 meters	1	2.6	2.6	7.7
	701 to 800 meters	6	15.4	15.4	23.1
	801 to 900 meters	7	17.9	17.9	41.0
	1001 to 2000	6	15.4	15.4	56.4
	over 6000	3	7.7	7.7	64.1
	a few yards	1	2.6	2.6	66.7
	Missing	13	33.3	33.3	100.0
	Total	39	100.0	100.0	

Location

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ANSE LA RAYE	2	5.1	5.1	5.1
	CAICO	2	5.1	5.1	10.3
	MISSING	1	2.6	2.6	12.8
	VANARD	15	38.5	38.5	51.3
	VENUS	19	48.7	48.7	100.0
	Total	39	100.0	100.0	

Age group

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	26 to 30 years	1	2.6	2.6	2.6
	36 to 40 years	3	7.7	7.7	10.3
	41 to 45 years	5	12.8	12.8	23.1
	46 to 50 years	5	12.8	12.8	35.9
	51 to 55 years	2	5.1	5.1	41.0
	56 to 60 years	8	20.5	20.5	61.5
	61 to 65 years	5	12.8	12.8	74.4
	66 to 70 years	1	2.6	2.6	76.9
	71 to 75 years	4	10.3	10.3	87.2
	76 to 80 years	3	7.7	7.7	94.9

	Missing	2	5.1	5.1	100.0
	Total	39	100.0	100.0	

Occupation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Farmer	12	30.8	30.8	30.8
	Customer Service Representative	1	2.6	2.6	33.3
	Bus driver	2	5.1	5.1	38.5
	Boat Captain	1	2.6	2.6	41.0
	Shop owner	4	10.3	10.3	51.3
	Farmer(vegetable)	1	2.6	2.6	53.8
	Supervisor water line maintenance	1	2.6	2.6	56.4
	Market vendor	1	2.6	2.6	59.0
	Retired	4	10.3	10.3	69.2
	Unemployed	2	5.1	5.1	74.4
	Not Applicable	1	2.6	2.6	76.9
	Construction Workers/ Carpenter	5	12.8	12.8	89.7
	Missing	4	10.3	10.3	100.0
	Total	39	100.0	100.0	

Total Household members

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	2.6	2.6	2.6
	1	8	20.5	20.5	23.1
	2	8	20.5	20.5	43.6
	3	10	25.6	25.6	69.2
	4	5	12.8	12.8	82.1
	5	3	7.7	7.7	89.7
	6	1	2.6	2.6	92.3
	7	1	2.6	2.6	94.9
	8	1	2.6	2.6	97.4
	15	1	2.6	2.6	100.0
	Total	39	100.0	100.0	

Main source of income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sale of Produce/ market vendor	4	10.3	10.3	10.3
	Sale of drinks and food items	1	2.6	2.6	12.8

	Employment	12	30.8	30.8	43.6
	Shop	3	7.7	7.7	51.3
	Family/ spouse assistance	6	15.4	15.4	66.7
	Farming	7	17.9	17.9	84.6
	Construction (masonry)	2	5.1	5.1	89.7
	Pension	1	2.6	2.6	92.3
	Missing	3	7.7	7.7	100.0
	Total	39	100.0	100.0	

Where go for health assistance(clinic specify)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	FAMILY PLANNING	1	2.6	2.6	2.6
	HEALTH CENTER	2	5.1	5.1	7.7
	None	10	25.6	25.6	33.3
	VANARD HEALTH CENTER	15	38.5	38.5	71.8
	VANARD HEALTH CENTER CHECK UPS	6	15.4	15.4	87.2
	VANARD HEALTH CENTER CLOSER AND CHEAPER	1	2.6	2.6	89.7
	VANARD HEALTH CENTER IS CLOSER	1	2.6	2.6	92.3
	VANARD HEALTH CENTER-CLOSE	1	2.6	2.6	94.9

	VANARD IS CLOSE	1	2.6	2.6	97.4
	VANARD IS CLOSE AND FREE	1	2.6	2.6	100.0
	Total	39	100.0	100.0	

Distance of health facility from residence

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 100 meters	1	2.6	2.6	2.6
	201 to 300 meters	1	2.6	2.6	5.1
	301 to 400 meters	1	2.6	2.6	7.7
	701 to 800 meters	6	15.4	15.4	23.1
	801 to 900 meters	7	17.9	17.9	41.0
	1001 to 2000	6	15.4	15.4	56.4
	over 6000	3	7.7	7.7	64.1
	a few yards	1	2.6	2.6	66.7
	Missing	13	33.3	33.3	100.0
	Total	39	100.0	100.0	

Concerns of the rehabilitation of the Vanard/Venus/Anse La Raye road on Housing

	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Landslides (from roads being dug, grading of the road, digging, damage to access road, living on hill)	6	15.4	15.4	15.4
	None	16	41.0	41.0	56.4
	Loss of homes	1	2.6	2.6	59.0
	Roads needs to be fix	3	7.7	7.7	66.7
	Fix housing make it better	2	5.1	5.1	71.8
	Retaining walls could be damaged	1	2.6	2.6	74.4
	Missing	10	25.6	25.6	100.0
	Total	39	100.0	100.0	

Concerns on agricultural production

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Loss of Lands	2	5.1	5.1	5.1
	Farms close to road might be damaged (destroyed) /lose crops and land	8	20.5	20.5	25.6
	Loss of livelihood or living	2	5.1	5.1	30.8
	Roads need to be fix	4	10.3	10.3	41.0
	Retaining walls need to be fixed	1	2.6	2.6	43.6
	Transportation	1	2.6	2.6	46.2

	None	3	7.7	7.7	53.8
	Easier access for farmers	1	2.6	2.6	56.4
	Missing	9	23.1	23.1	79.5
	None	8	20.5	20.5	100.0
	Total	39	100.0	100.0	

List Items to be compensated for

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Land	5	12.8	12.8	12.8
	Whatever is affected	1	2.6	2.6	15.4
	Road	1	2.6	2.6	17.9
	Home	7	17.9	17.9	35.9
	Shop	1	2.6	2.6	38.5
	Protective or Retaining Wall	3	7.7	7.7	46.2
	Crop close to road	2	5.1	5.1	51.3
	Not Applicable	2	5.1	5.1	56.4
	Missing	16	41.0	41.0	97.4
	None	1	2.6	2.6	100.0
	Total	39	100.0	100.0	

Preferred mode of compensation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Cash value	24	61.5	61.5	61.5
	Land for land	1	2.6	2.6	64.1
	Not Applicable	2	5.1	5.1	69.2
	Missing	12	30.8	30.8	100.0
	Total	39	100.0	100.0	

Other modes of compensation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Applicable	8	20.5	20.5	20.5
	Land for land	2	5.1	5.1	25.6
	Fixing whatever gets damaged	1	2.6	2.6	28.2
	Missing	18	46.2	46.2	74.4
	Not Applicable	10	25.6	25.6	100.0
	Total	39	100.0	100.0	

Location

	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	CAICO	8	17.4	17.4	17.4
	DURANDEA	3	6.5	6.5	23.9
	DURANDEAU	2	4.3	4.3	28.3
	MISSING	11	23.9	23.9	52.2
	VANARD	6	13.0	13.0	65.2
	VENUS	16	34.8	34.8	100.0
	Total	46	100.0	100.0	

Age of head of household

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	36	1	2.2	2.2	2.2
	37	2	4.3	4.3	6.5
	39	1	2.2	2.2	8.7
	44	1	2.2	2.2	10.9
	45	1	2.2	2.2	13.0
	47	1	2.2	2.2	15.2
	48	2	4.3	4.3	19.6
	49	2	4.3	4.3	23.9
	51	1	2.2	2.2	26.1
	52	2	4.3	4.3	30.4
	53	1	2.2	2.2	32.6

	56	2	4.3	4.3	37.0
	58	1	2.2	2.2	39.1
	59	1	2.2	2.2	41.3
	62	1	2.2	2.2	43.5
	63	1	2.2	2.2	45.7
	66	1	2.2	2.2	47.8
	67	1	2.2	2.2	50.0
	70	1	2.2	2.2	52.2
	73	2	4.3	4.3	56.5
	79	1	2.2	2.2	58.7
	82	1	2.2	2.2	60.9
	MISSING	18	39.1	39.1	100.0
	Total	46	100.0	100.0	

Occupation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Farmer	8	17.4	17.4	17.4
	Bus driver	1	2.2	2.2	19.6
	Labourer	3	6.5	6.5	26.1
	Concierge	1	2.2	2.2	28.3
	Flower vendor	1	2.2	2.2	30.4

	Janitor or cleaning	1	2.2	2.2	32.6
	Office Attendant	1	2.2	2.2	34.8
	Nursing Assistant	1	2.2	2.2	37.0
	Security guards	1	2.2	2.2	39.1
	Waiter	1	2.2	2.2	41.3
	Shop owner	2	4.3	4.3	45.7
	Farmer(vegetable)	1	2.2	2.2	47.8
	Retired	2	4.3	4.3	52.2
	Unemployed	5	10.9	10.9	63.0
	Construction Workers/ Carpenter	2	4.3	4.3	67.4
	Missing	15	32.6	32.6	100.0
	Total	46	100.0	100.0	

Time lived in area

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6 to 10 years	2	4.3	4.3	4.3
	11 to 15 years	1	2.2	2.2	6.5
	31 to 35 years	1	2.2	2.2	8.7
	36 to 40 years	2	4.3	4.3	13.0
	41 to 45 years	4	8.7	8.7	21.7

	46 to 50 years	6	13.0	13.0	34.8
	51 to 55 years	5	10.9	10.9	45.7
	56 to 60 years	3	6.5	6.5	52.2
	61 to 65 years	1	2.2	2.2	54.3
	66 to 70 years	3	6.5	6.5	60.9
	71 to 75 years	1	2.2	2.2	63.0
	81 to 85 years	1	2.2	2.2	65.2
	Whole life	6	13.0	13.0	78.3
	Missing	10	21.7	21.7	100.0
	Total	46	100.0	100.0	

If yes why

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Tourism benefits	1	2.2	2.2	2.2
	Help with or enhance farming activities	2	4.3	4.3	6.5
	Food transportation	1	2.2	2.2	8.7
	Persons need good roads/ road conditions	5	10.9	10.9	19.6
	Communities need good roads	12	26.1	26.1	45.7

	Easy or quicker road passage for emergency vehicles	3	6.5	6.5	52.2
	Greater employment opportunities	3	6.5	6.5	58.7
	Business opportunities	5	10.9	10.9	69.6
	Ease in running errands/ commuting	7	15.2	15.2	84.8
	Better access to schools/ health centers and other ammenities	2	4.3	4.3	89.1
	Community Development	2	4.3	4.3	93.5
	Missing	2	4.3	4.3	97.8
	Missing	1	2.2	2.2	100.0
	Total	46	100.0	100.0	

What good things can you see in the community

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Employment, Community Center and playing feild	17	37.0	37.0	37.0
	Proper housing and roads	6	13.0	13.0	50.0
	Children can play safely	2	4.3	4.3	54.3
	Increased business activity in the area	6	13.0	13.0	67.4

	Community togetherness/ pride	7	15.2	15.2	82.6
	Better care for the elderly	1	2.2	2.2	84.8
	None	1	2.2	2.2	87.0
	Dont Know	1	2.2	2.2	89.1
	Tourism activity	1	2.2	2.2	91.3
	Missing	3	6.5	6.5	97.8
	None	1	2.2	2.2	100.0
	Total	46	100.0	100.0	

Yes how does this affect you

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Increased bus fare/ strike	16	34.8	34.8	34.8
	Buses do not want to transport passengers in areas where roads are bad	4	8.7	8.7	43.5
	Financial cost in servicing vehicles	1	2.2	2.2	45.7
	Damage to vehicle	8	17.4	17.4	63.0
	Not Applicable	3	6.5	6.5	69.6
	Longer travels using alternate route	2	4.3	4.3	73.9
	Pot holes	1	2.2	2.2	76.1

	Abandon farms	1	2.2	2.2	78.3
	Tourism and tours	1	2.2	2.2	80.4
	Vehicle cannot be used	1	2.2	2.2	82.6
	Missing	8	17.4	17.4	100.0
	Total	46	100.0	100.0	

How would you like to see road upgrade

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Proper paved and smooth roads, side walks	19	41.3	41.3	41.3
	Proper drainage and wider well maintained roads	14	30.4	30.4	71.7
	Proper Retaining Walls and drains	7	15.2	15.2	87.0
	Safe road for school children to walk	2	4.3	4.3	91.3
	Proper barriers	1	2.2	2.2	93.5
	Missing	3	6.5	6.5	100.0
	Total	46	100.0	100.0	

APPENDIX 8

MINUTES OF COMMUNITY MEETINGS

Minutes of Community Meetings

Community meeting No 2, in Anse Le Raye

:

Project officials present –

- Henix Joseph- Social specialist
- Kerchik Charles – CAD specialist

persons in attendance

- Julle 520-7389
- Laura 7203894
- Nola Mitchel 7211823
- Harley Iddl 5208255
- Others members did not want their names recorded however there were 35 women and 30 men at the town hall meeting.

Dates of meeting -: Wednesday, 5th, February, 2020 **Venue** – Anse Le Raye community hall at 7:30 pm

PURPOSE: The second meeting was held in the community for purposes of a consultation re the preparation of completed designs for the Anse Le Raye, Varnard road - ESIA

TEAMS Inc attended the meeting at the Anse Le Raye community center. The Chair was the social specialist Henix Joseph, who informed the meeting that the road was of national importance and was being considered for reconstruction with climate change considerations given the number of landslides in the area. He noted that the reason for the consultation was to obtain feedback from the community members. He noted that a questionnaire was developed and in filling out the questionnaire a report will be developed on the Environmental and Socio-Economic impact of the proposed road reconstruction.

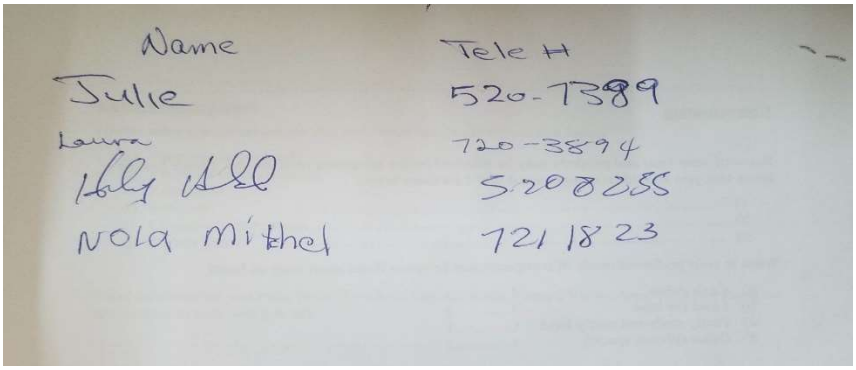
1. Women were mostly concerned about the children's safety whilst walking along the roadside at present. During upgrade there is a request for walking lanes/ sidewalks.

2. Women were concerned about the; level of dust that is raised by the road surface. After upgrade it is likely that more vehicles and more dust would be generated.
3. There was concern that the runoff would flow into the catchment and therefore contaminated.
4. Need for a layby for people to do bird watching to reduce the instances of parking in the roadway
5. There was concern of the heavy trucks destroying the road surface and request that the road be designed to withstand the heavy loads.
6. Concern that the byproducts of the pumice washing flows into the river and cause degradation to the riverine and marine environment
7. Whether the road should be placed in the same landslide prone area or remove the road entirely to an alternative location
8. Anticipate that village tourism would be increased with the advent of the road opening. Vendors want to be preemptive and proactive to be prepared in advance of the tourist arrivals by preparing for the types of payments card and cash. Therefore a uniform payment system for vendors should be explored.

General matters of community concern

9. Dust on the Anse la Raye end in proximity to the school.
10. Sidewalks on the Anse la Ray end.
11. The out fall of all drains into the river is a concern.
12. The quarries and their processing of material and their disposal of their byproducts.
13. Persons were interested in the commencement date of the Project.
14. Overview of projects was given by consultant N.St.ville.
15. Whether funding has been secured? The group was informed that GOSL has secured the funding for the project
16. Given that majority of that area is used for wildlife watching an area for layby was recommended to be used for bird and wildlife watching.
17. The meeting was concerned about the occurrence of accidents given that the area is a high rainfall area, it was recommended that the project mitigate against accidents using barriers, retaining walls, drainage, landslides and road widening.
18. Since the road closure farmers have had to abandon their farms with resultant loss of income, breadbasket for the village of Anse la Ray.
19. One of the farmers had a contract to supply food to the hotel and lost the contract because of the closure
20. The loss of tours has created a loss of revenue for the vendors.
21. The credit union will be able to service their members a lot better
22. The journey time by the busses onward to the south of the island will be reduced with improvement of the road
23. The fish fry has lost many patrons from the local Millet community with the blockage of the road
24. The road was needs to be designed to suit the mining operations done by the quarries in the area
25. The issue of the dust was raised.
26. The credit union expects to get an increase in membership from the Millet community

27. The area is a nature sanctuary and persons go there to see the parrot and bird watching, this is no longer done because the road was closed
28. Concern that Roads are constructed without Maintenance and clearing of drains and landslides.
29. Alternative route for vehicles in the event of road closure.
30. There are Boa constrictors coming into the village and there was need for protection from the snakes,
31. Because of the reduction if farming, the rodents have now appeared in the village and someone offered that this is the reason that the snakes are prevalent in the village, this is a food chain matter.
32. There was a question as whether the roads in Anse La Raye will be included in the works.



AGENCY (IES) ASSIGNED: PCU, Community meeting in Anse Le Raye

:

Project officials present –

- Mrs. Marilyn A. Cuffy-Morris - Project Manager/DVRP
- Mr. Norman St. Ville – Engineer
- Henix Joseph- social specialist
- Adam Toussaint – Forestry specialist
- Kerchik Charles – CAD specialist

Persons in attendance

- Mr. Kershiek Charles
- Eustace Asgod
- E. Griffith
- Stephan Griffith
- Bryan Deor
- Chaneus Joseph
- Reeves Lawrence
- Kevin Smith
- Anthony Montoute
- Salpetrier C Paricte

All members present did not sign the register

Dates of meeting -: Saturday, 25th, January, 2020 **Venue** – Anse Le Raye community hall at 6:30 pm

PURPOSE: The meeting was held in the community for purposes of a consultation re the preparation of completed designs for the Anse Le Raye, Varnard road - ESIA

Mr. St. Ville and his team attended the meeting at the Anse Le Raye community center. The Chair was the social specialist Henix Joseph, who informed the meeting that the road was of national importance and was being considered for reconstruction with climate change considerations given the number of landslides in the area. He noted that the reason for the consultation was to obtain feedback from the community members. He noted that a questionnaire was developed and in filling out the questionnaire a report will be developed on the Environmental and Socio-Economic impact of the proposed road reconstruction.

Mr. St. Ville presented the technical footage of the road and noted that the funding would come from the DVRP project financed by the World Bank. He noted that the governments' focus was on climate change and concern about preparation in event of a natural disasters. He noted that the government was aware of the landslides in that area and every effort is being made to attend to this but he wanted to obtain feedback as to how will the road affect the livelihood of the community persons. He noted that the road led to the forest reserve and also to another community.

Mr. St. Ville requested feedback from the members on what would be their concerns during construction, how the road would affect the livelihood of the community persons and individually as well. He also noted that where land acquisition will play a factor the respective GOSL department will get involved. There is an area where the road will probably be diverted but the owner of the respective was not present at the meeting.

The following was noted by the community members -

There are many plant species in the area that would be important for tourist attraction.

- In response to how soon will the project start, the meeting was advised that TEAMS Inc. was responsible for the ESIA report. The report is expected to be completed by February and the completed designs by the end of March, 2020 and construction may start in July – August, 2020.
- In response to the question, has funding been identified for the project, the Project Manager noted that the financing was provided for under the DVRP World Bank project.

Benefits of the road given by the meeting –

- Quick transportation from one community to the other.
- The road would be a blessing for the community if restored
- Farmers have their homes in the Anse La Raye village and their farms in the Venus millet area, the access to farms has therefore been severed

- The agricultural land is in the Venus area and was referred to as the bread basket of Anse La Raye, one of the farmers lost over 5000 pineapple crops after having to abandon his farm and will likely return if the road is improved
- Reversal of what is now a total loss of livelihood for the village
- Cut down travelling time between communities
- Vendors will be able to vend again to earn a living.
- More trips to the rainforest by tourists and locals.
- The road is needed urgently.
- Shorter distance to Vieux Fort to conduct business
- It's an alternative route in the event of blockage on the west coast road.
- If anyone gets bitten by the poisonous snakes or needed medical attention this will be a quicker alternative.
- There has been no real reported abuse of wildlife by the community over the years of the road in operation.

Concerns –

- Up to five (5) people are reported to have died from the Fer de Lance snake bites over the past 10 years
- The road provides relief in the event that persons get bitten by a poisonous snake and need medical attention and is now impassible
- This road is the only bypass available in the event that damage occurs on the West coast road of St. Lucia
- The tour operators using that road, brought tourists into the village and the livelihoods have been lost
- The road is very narrow in some areas and is cause for concern given the steep drops that exist along the road.
- There is a concreted area which is very slippery and dangerous.
- In particular areas there is a lot of forest cover and needed to be cut back to allow for sunshine to reduce the slipperiness of the road and to keep the road dry.
- There is precipice in certain areas and protection barriers are needed to be built
- Drainage is needed in certain areas.
- Landslides occur when it rains, slope stability is therefore of concern. What about terracing these areas.
- Vendors purchase farm items from Castries and resell them at exorbitant prices in the community so there is need to open the road so farmers can continue to farm on their lands. Loss of income due to this
- The flora and fauna should be protected during construction.
- There was previously lack of maintenance done on the road and residents expressed concern that the same could reoccur.
- Most persons indicated that they would kill the Fer de lance snake if they came into contact with one

CHALLENGES / PROBLEMS TO BE RESOLVED

- Completed Designs to be prepared by March, 2020

RECOMMENDATIONS:

Continue to work speedily with the Engineer and the communities speedily to obtain all information for the EISA which will inform the completed designs.

Some of the Key Institutional stakeholders identified and consulted.

Name or Interviewed Person	Designation	Organization
Stephen Griffith	Deputy Chairman, farmer	Anse La Raye Village Council
Reeves Lawerence	Council member/Retired School Principal	Anse La Raye Village Council
Andre Lansiquot	Chair person	Canaries Village Council
Sean Mathurin	Director of Statistics	Statistics Department
Justine Charles	Local Government Officer	Ministry of Social Transformation, Local Government and Community Empowerment
Tommy Descartes	Chief Economist	Department of Economic Development
Calvin Lee	Deputy Permanent Secretary	Department of Infrastructure Ports and Energy
Amos Hippolyte	Engineer	Department of Infrastructure Ports and Energy
Natalie Popovic	Zone Engineer	Department of Infrastructure Ports and Energy
Guy Joseph	Parliamentary Representative	Government of St. Lucia
Dominic Fedee	Parliamentary Representative	Government of St. Lucia
Raphael Eudovic	Operations Manager	St Lucia Water and Sewerage Authority
Parker Ragunanan	Chief Environmental Health officer	Department of Environmental Health
Kenwell Jn Baptiste	Chief Agricultural Extension officer	Department of Agriculture
Cyrus St. Croix	Secretary	Anse La Raye 1987 All Stars
Cosmos Robinson	Founding member	Anse La Raye Foundation Sports Club

Mindy Marius	Member	Anse La Raye Vendors Association
Frederick	Representative	Anse La Raye Minibus Association
Taija Adjoudha	General Manager	Island Adventures Co. Ltd
Mary George	Teacher	Millet Primary School
Alex Zepherin	Management Team	West Coast Communities Co-operative Credit Union Society Ltd.
Crystal Cox	Manager	Tropical Farms Supplies Ltd located in Vanard
Justin Sealy	General Manager	St. Lucia Solid Waste Management Authority
Pius Haynes	Wildlife Conservation Officer	Forestry Department
D.P Nathaniel	Forestry Officer attached to the Wildlife Unit	Department of Sustainable Development

APPENDIX 9

COVID-19 PROTOCOLS FOR CONSTRUCTION SITES

APPENDIX II

COVID-19 PROTOCOLS FOR QUARRIES, CONCRETE AND CONSTRUCTION SITES

1. MANAGEMENT

- Provide sanitary measures on site to prevent the spread of COVID-19 e.g. hand washing stations, toilet facilities, continuous supply of potable water, provision of hand sanitizer, provision of disinfectant and cleaning products,
- Observe physical distancing measures 6 feet apart.
- Develop and implement a site transportation protocol.
- Prepare a COVID-19 response plan to identify processes for dealing with suspected and confirmed COVID-19 cases.
- Communicate the site expectations and prevention measures to all workers and contractors.
- Provide adequate PPEs for staff
- Stay in contact with all workers including those who may be in isolation or working remotely. Conduct sensitization talks regularly and keep track where and when workers are on site for contract tracing purposes and ensure they have the correct PPE.
- Ensure that all health and safety protocols are still practiced.
- Management must prepare and submit to the Department of Labour (Occupational Safety and Health), Environmental Health Division a comprehensive plan occupational health and safety, COVID 19, site transportation protocols, cleaning and sanitizing protocols and site management protocols within seven (7) days of opening.

2. BEFORE ARRIVING ON SITE

- Management/contractor must create a plan indicating the steps they will take to mitigate risks presented by COVID-19. The details of the plan must be communicated to workers before they start work.
- Where possible, conduct a remote induction before arrival on site, this can be done via video conferencing or by phone. If in-person induction is required, the Physical distancing and hygiene protocols must be followed
- All workers should follow the Personal health flowchart to confirm they are safe to be on site:
  - **Employees who have symptoms of acute respiratory illness should notify their supervisor and stay home.**
  - **Sick employees should not come to work until they are free of fever (temperature of 100.4° F [37.8° C]) or greater, signs of a fever, and any other symptoms for at least 24 hours, without the use of fever-reducing or other symptom-altering medicines.**
  - **Employees must inform Management of recent travel history**
  - **Employees who have been in close contact with someone infected by COVID-19, must also inform management.**

- Employers must have an understanding of how workers will travel to and from site and will communicate the Site Transportation protocol to all.
- Ensure all workers understand that additional PPE may be required due to COVID-19 as per the Ministry of Health and Wellness PPE Guidelines.

3. SITE ENTRY

- Only relevant personnel to the workplace are to access the site. All office employees supporting a project will work remotely, where possible.
- A daily register of workers entering and leaving site must be completed along with a health declaration. If electronic sign in machines are used, these must be cleaned and sanitized after each use. Use your existing sign in register.
- Signage reminding workers of the COVID-19 physical distancing and hygiene protocol must be posted at the site entrance and in common areas where appropriate.

4. SITE OPERATIONS

- All work is to be undertaken in such a way as to reduce any possible contact between workers and to promote physical distancing wherever possible, as per the Physical distancing protocol.
- All visitors to the site, such as necessary delivery workers, will be restricted to two persons wherever possible. These workers must follow the Site Transportation protocol.
- All offices and jobsites must implement cleaning measures as per the Cleaning guide
- All tools, equipment, plant and vehicles must be used in alignment with the Cleaning guide.
- Continuous sensitization sessions must be conducted while observing physical and hygiene protocol.
- Smokers must follow the Physical distancing and hygiene protocol.
- A COVID-19 Response plan must be available and accessible on site.

5. LEAVING SITE

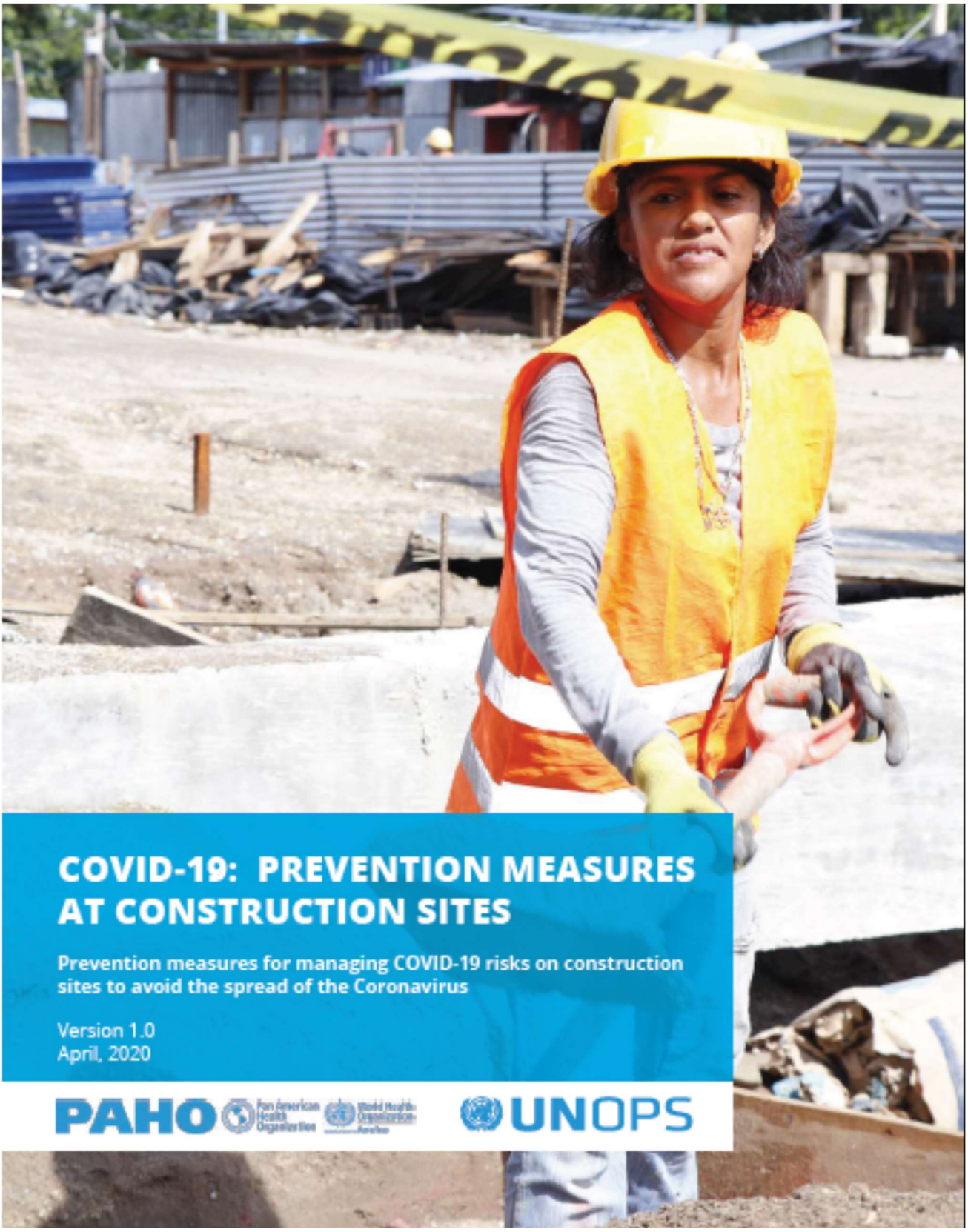
- Workers must sign the register when leaving the site.
- When returning home/leaving site, workers will need to follow the necessary hygiene measures.
- Each site must be cleaned and sanitized at the end of the working day or end of each shift, as per the Cleaning guide.
- All waste and disposable PPE must be removed from site and securely disposed of as per site cleaning protocol.
- Workers must follow the Site Transportation protocol.

PAHO Guidelines for the Prevention of COVID 19 on Construction Sites

Additional guidelines provided below from the **Pan American Health Organization (PAHO)** which outlines measures and recommendations aimed at limiting the risk and preventing the spread of COVID-19 for construction sites. These guidelines can be sourced from the PAHO website at:

https://www.paho.org/en/documents/covid-19-prevention-measures-construction-sites-prevention-measures-managing-covid-19

https://iris.paho.org/handle/10665.2/52217



COVID-19: PREVENTION MEASURES AT CONSTRUCTION SITES

Prevention measures for managing COVID-19 risks on construction sites to avoid the spread of the Coronavirus

Version 1.0
April, 2020

PAHO Pan American Health Organization World Health Organization Americas

UNOPS

In the face of the COVID-19 emergency, PAHO/WHO and UNOPS recommend implementing the following prevention measures at construction sites:

>> General Guidelines

1. The contractor will assign a focal point to implement and monitor prevention measures.
2. Restrict entry to all visitors during the epidemic, until further instruction.
3. If a worker or any other individual feels ill, they must stay home.
4. Hold briefings at the beginning of the workday to discuss COVID-19 regarding:
   - Raise awareness on how to prevent exposure and contagion by the virus (ways it presents, how to avoid its spread, symptoms and signs, etc.)
   - Highlight the importance of proper and frequent hand washing.
   - Promote respiratory hygiene that emphasizes on covering the face when sneezing and coughing, and properly wiping the nose; thus controlling the primary source of the contagion.
5. Take the temperature of all personnel and ensure that they wash their hands before entering the site or the project office.
6. Upon arrival at the construction site, the following preventive guidelines must be maintained:
   - Avoid handshakes, hugs and any other forms of close contact on the job.
   - Maintain a **minimum distance of 1 meter** at all times (entrance to the project, meetings, lunch, etc.)
   - Avoid touching your face (eyes, nose, mouth) without washing your hands.
   - Wash hands before eating and drinking and do not share food or drinks with colleagues.
   - Do not share or exchange your personal protection equipment (PPE).

7 Make sure of the availability of the following supplies in sufficient quantity:

- Liquid soap, disposable disinfecting towels, alcohol-based gel and/or liquid alcohol.
- Stations for hand washing at various points of the site (at the entrance, dining room, temporary offices, operating plant, etc.)
- Disposable towels and tissues.
- Closed containers or bags for the disposal of towels and tissues, identified and located at various points of the site.
- Masks[1], disposable gloves and protective glasses.
- Remote or tape thermometers.

8 The use of face masks is not mandatory at the site[2], except under the following circumstances:

- If an individual has chronic health conditions (asthma, diabetes, cancer, hypertension, etc.)
- If an individual presents symptoms (cough, runny nose, etc.)
- If an individual is over 60 years of age.
- If the minimum distance between personnel cannot be met (less than 1 meter).

9 The use of disposable gloves will be mandatory depending on the nature of the tasks to be carried out, under the responsibility of the focal point designated by the contractor. For example: workers responsible for handling food and beverages, those involved in general cleaning tasks, vehicle drivers, security guards in access control, etc.

10 Follow the instructions of the local authorities.

[1] The use of masks is to avoid contact with droplets or secretions that the infected person expels when speaking, coughing or sneezing, and that are capable of transmitting the virus.

[2] These recommendations must be addressed in addition to any norm, regulation or directive issued by each country.

>> Prevention Measures

The Contractor, through its focal point for occupational safety, must carry out the following specific prevention measures:

1 Clean the following areas at least twice a day:

- Surfaces and objects such as tables, desks, telephones, keyboards, glasses, etc. with cleaners, disinfectants, alcohol and / or disposable towels.
- The dining room and other food intake areas or cafeteria (tables, chairs, etc.)
- Vehicles: contact surfaces prior to use (door, rudder, dash, handbrake, etc.)

2 Encourage frequent handwashing of all personnel in the project (workers, supervisors, visitors):

- All personnel should wash their hands when entering and leaving the site, and before and after mealtimes.
- Verify that hand washing stations have enough soap and water (twice a day at a minimum).
- Place posters about proper hand washing at different project sites (work fronts, temporary offices, and the project operations campus).

3 Promote good respiratory hygiene:

- Place posters that promote good respiratory hygiene at different project sites, mainly on the work fronts, temporary offices and the project's operations campus.
- Make sure that disposable tissues (kleenex or similar) are available for people with allergies (rhinitis) or allergic or smoking coughs, promoting the use of disposable tissues to cover your mouth, sneeze, or wipe your nose.
- Dispose of the tissues in separate and closed containers, properly labeled and placed at different points of the project, keeping them in tightly closed containers or bags until their final disposal.

4 Prepare a registry of workers suffering from chronic diseases such as diabetes, hypertension, coronary problems, asthma, allergies, cancer, etc. The record must be submitted to the Project Manager. The record must include at least the following information:

- High-risk individuals (only yes or no criteria to maintain confidentiality)
- Exposure to risks (eg travel, people infected in the family)
- Symptoms that align with the incubation period of the virus or its development

5 Work organization:

- Analyze the work fronts and distribute the staff according to the minimum distance.
- **In cases where it is necessary to work less than a meter apart or in confined environments, masks should be used.**
- Establish working groups to minimize the movement of people in the project area to facilitate traceability and control, in case any possible contagion is identified.

6 Food intake areas (dining rooms):

- Having enough dining places in the project site.
- Define specific schedules for meal times, to avoid crowding.
- Make sure people sit within a moderate distance during meal times (you can mark the spaces to sit).

7 Dressing rooms on project site:

- Enable a defined space for men's and women's locker rooms at project sites.
- Workers will have to change their clothes when entering and leaving the project.
- Masks and gloves must be removed safely in order to bring them to their final disposal.

>> Screening process before entering the site

Upon arrival at the site, a person assigned by the Contractor's focal point will ask the following questions to the staff:

1. Have you had any fever, congestion, choking, or cough in the past 2 weeks?
2. Is there someone at your home who has these symptoms or is sick with COVID-19 (Coronavirus)?
3. Are there people with symptoms or diagnosis of COVID-19 (Coronavirus) in your neighborhood or community?
4. Have you been abroad or in contact with people from countries, regions or cities with COVID-19 (Coronavirus)?

>> Preventive measures related to the use of transportation

Transportation provided by the Contractor

If transport for project workers is provided by the contracting company (bus or other), the following measures should be applied:

- Daily cleaning of transport units.
- The driver should wear gloves, wash their hands during the working day, and before and after the use of gloves.
- Place alcohol-based gel dispensers on the door and at another point in the vehicle.
- Place posters at different points of the vehicle.
- Provide containers for the disposal of disposable tissues. The waste must be handled by those in charge of the transportation unit as hazardous waste.

- Keep the windows open for sufficient ventilation as much as possible, allowing sunlight to enter the interior of the vehicle.

- Transport passengers that keep a separate space between them when seated exclusively.

Public transportation

People who need to travel from their homes to project sites and vice versa using public transportation, should take the following preventive measures:

- Use disinfecting wipes after touching surfaces (doors, handles, etc.). After use, place them in available garbage cans or in a plastic bag that can be carried, close it tightly and place it in a suitable place.

- Bring alcohol-based gel with you and apply it to your hands every time you touch any surface, make a payment or take any other action.

- Avoid touching your face before, during and after being on the vehicle.

- If the transport unit does not have enough space available, take the next available vehicle, which must be considered a valid excuse for late arrival.

- Wash your hands well with enough soap and water when you reach the final destination.

> Measures before entering the house after a working day

Upon arriving home from the construction site, staff should take the following steps:

- Wash your hands as soon as you get home.

- Do not touch any surface when entering the house, before washing your hands.

- Change your shoes and outer clothing, and place it in a bag to wash it. Clothes that have been used in the workplace should be washed right away, and the same procedure must be followed for every time you leave home.

- Place bags, keys or other items that you have taken with you in a box or container at the entrance of the house, and clean or disinfect them as appropriate.

- Wear gloves for disinfecting cell phones, glasses, watches, and other personal effects with cleaning towels, disinfectants, alcohol, or soap and water as appropriate.

- Take a shower or wash the areas of the body that have been exposed while away from home.

- Remind the worker about the importance of practicing general measures of personal hygiene and social distancing to avoid contaminating his home.

>> Procedure to follow in case of contagion

1 Any worker with a cold, even a mild one or a fever above 37.3 ° C, should:

- Notify a supervisor that you are not fit to work.

- Stay at home for at least 14 days. Once at home, the person with symptoms should follow the protocols established by the national authorities.

- Check their temperature control twice a day.

- Report any person in your immediate family or where you live, that has these symptoms and inform your supervisor if they have taken medications such as acetaminophen, ibuprofen or aspirin that may cover the symptoms.

2 If you identify someone with symptoms, or someone who has been sent home because they have reported symptoms, or a close family member, or anyone with whom you live, you must notify the person in charge of Occupational Safety and Health and the Manager by completing of an incident report.

>> Stress Management

If personnel show signs of distress, sadness, confusion, or anxiety because of the epidemic, share with staff some of the following tips that may be helpful:

1. Remain well informed on the risk situation at the construction site and recognize your level of security in it. If you have any questions, ask your supervisor.

2. Maintain a healthy lifestyle on and off the site as much as possible, including:

    - Maintain a proper diet, and get enough rest.

    - Get daily exercise or recreational activities with your family on a daily basis.

    - Avoid the consumption of tobacco, alcohol or tranquilizers.

    - Limit exposure to news so as not to create more distress.

3. Call on people who have helped you in similar situations and who will always be available to you.

4. In case you feel overwhelmed and in need of help:

    - Identify a trusted family member or friend who listens to your concerns.

    - Contact a health professional or the company's employee support service.

FINAL NOTE

These recommendations must be implemented in addition to any norm, regulation or directive issued by each country, bearing in mind the social protection coverage in terms of health and occupational risks in each country.

>> Suggested materials for visual communication on site

Download the materials here:

CORONAVIRUS | PREVENTION AT CONSTRUCTION SITES

WASH YOUR HANDS WITH SOAP AND WATER

This process should last from **40 to 60 seconds**

1. 
Wet your hands with water

2. 
Put a sufficient amount of soap in the palm of your hand

3. 
Rub your palms together

4. 
Rub the palm of your right hand against the back of your left hand and vice versa

5. 
Rub your palms together, fingers interlocked

6. 
Rub the back of the fingers of one hand with the palm of the opposite hand, holding your fingers

7. 
Rub the left thumb in a rotary motion and vice versa

8. 
Rub your fingertips against the other hand in a rotational motion and vice versa

9. 
Rinse your hands with water

10. 
Dry yourself with a disposable towel

11. 
Use the towel to turn off the tap

12. 
Your hands are clean

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CORONAVIRUS | PREVENTION AT CONSTRUCTION SITES

LOOK FOR ALTERNATIVE GREETINGS

AVOID GREETING WITH HANDS, HUGS AND DIRECT CONTACT. DON'T TOUCH YOUR FACE.

greet with the elbow

from distance

or with the foot

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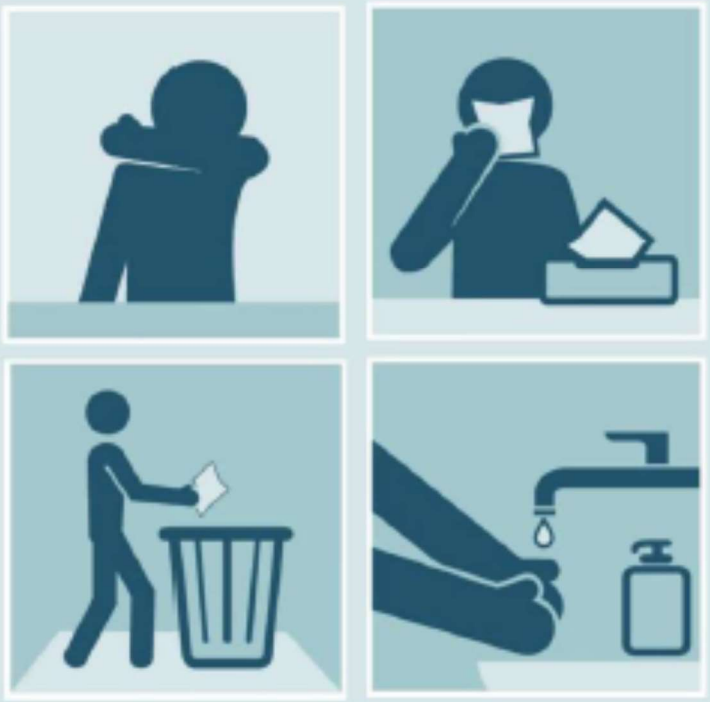
CORONAVIRUS | PREVENTION AT CONSTRUCTION SITES

RESPIRATORY HYGIENE



When you cough or sneeze, cover your mouth with a disposable tissue, then throw it in the trash and wash your hands

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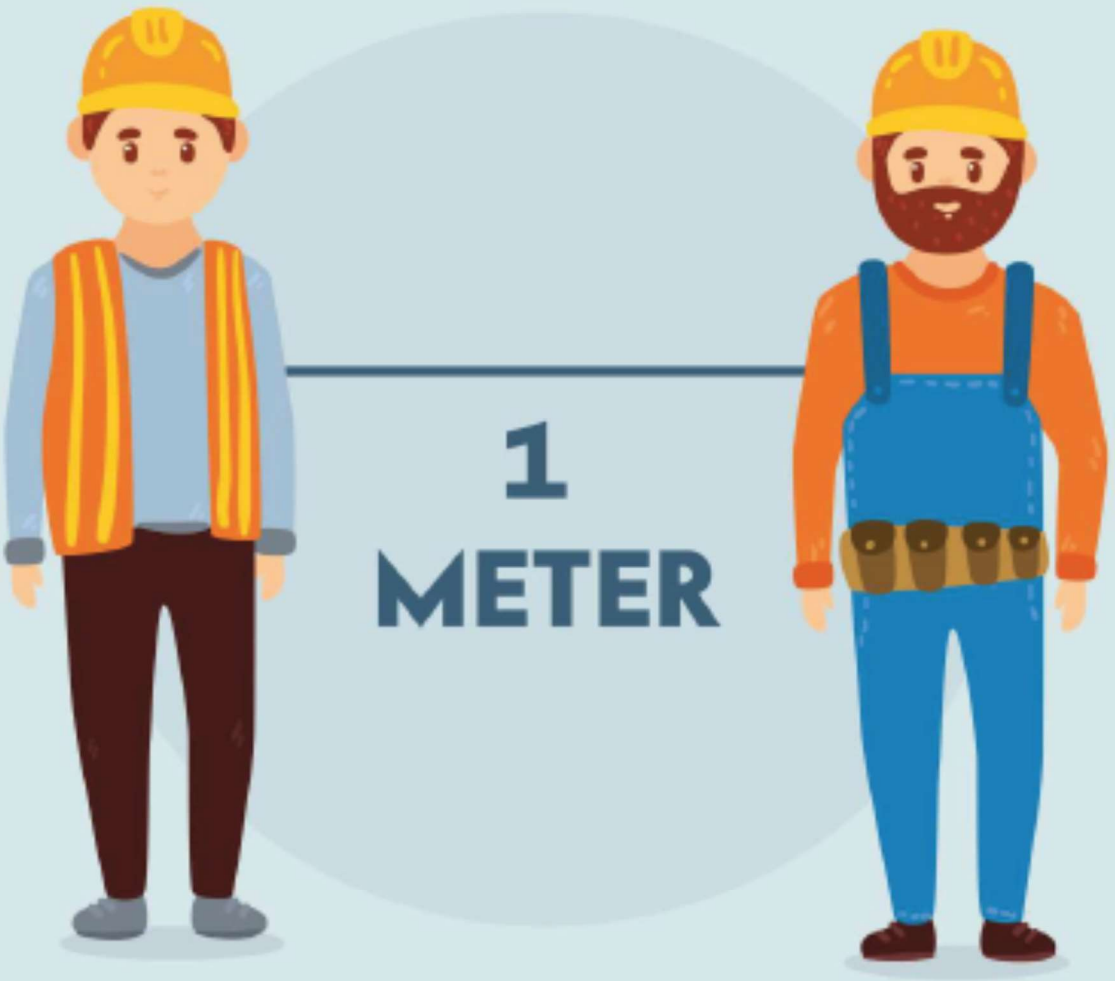
MINIMUM DISTANCE AT CONSTRUCTION SITES



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HOW CAN I PROTECT MY FAMILY?

Avoid close contact without protection, do not touch your face and constantly wash your hands. Also be sure to follow the instructions of local authorities regarding movement restrictions.

Avoid sharing glasses, plates, and other items for personal use, and clean and disinfect objects and surfaces that are touched frequently.

If you have traveled to areas where the virus circulates or have been in close contact with someone who has it and you have fever, cough, or difficulty breathing, seek medical attention immediately. Don't self-medicate.

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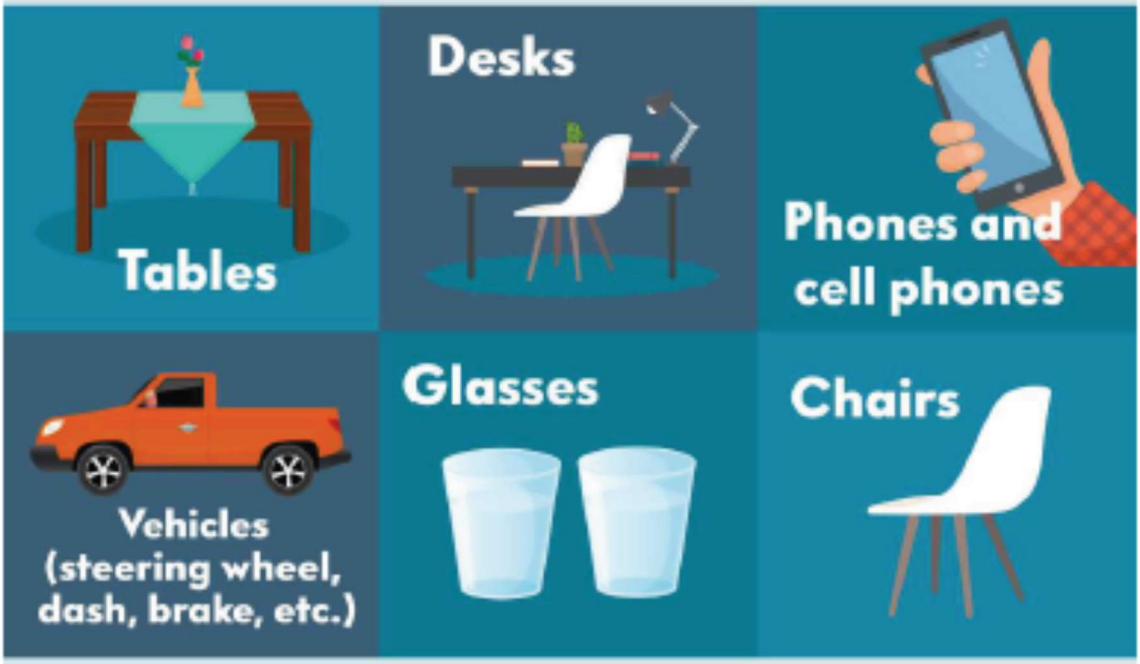
ORDER AND CLEANLINESS IN WORK AREAS

CLEAN THE FOLLOWING AREAS AND OBJECTS AT LEAST TWICE A DAY



YOU CAN USE DISINFECTANTS, ALCOHOL AND / OR DISPOSABLE TOWELS

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Construction sites should be treated as offices. It is recommended to take the following measures at construction sites:

Check your temperature and make sure to wash your hands before entering the site and before eating a meal

Handshakes, hugs, and other close interactions should be prohibited on the construction site

Any staff member showing flu symptoms should be prevented from entering the construction site

Mealtime designated areas should be sanitized daily

The use of a mask is not necessary for work on the construction site, unless the minimum distance is not met or the person's state of health requires it

In the event that a worker is detected with COVID-19, the construction site will be closed and the workers in contact with the individual must be isolated for 14 days until the medical authorization is granted

Personal hygiene must be maintained at all times on construction sites. Avoid touching your eyes, nose, and mouth. In case of cough, fever, or shortness of breath, seek medical attention immediately

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APPENDIX 10

SIMPLE CHANCE FIND PROCEDURES GUIDE

Annex 1- Sample Chance Find Procedure

Purpose

During project implementation/construction, there is the possibility that previously unknown cultural heritage items may be discovered. This Chance Find Procedure is intended to manage impacts to unknown cultural heritage items. The procedure should be implemented in collaboration with the relevant national authority responsible for cultural heritage. It is important that all project staff and contractor be aware of the potential to discover chance finds and the procedures outlined here.

Objectives

The objectives of the Chance Find procedure are:

-To define the steps that must be followed to manage the discovery of previously unknown cultural heritage, including the preservation and appropriate treatment of these finds, while also minimizing the potential disruption to the project schedule

- To enable compliance with relevant national laws and regulations along with other requirements that relate to the discovery of heritage items

Scope

This procedure is applicable to all activities conducted by project personnel that have the potential to uncover surface or subsurface items of cultural significance which were previously unknown. The procedure does not include already known and documented items.

Steps

N.B. The project should have on-call a suitably qualified archeologist who will be able to oversee the procedure and correctly identify and advise how to manage chance finds.

If a chance find is discovered the following steps should be undertaken:

1. Issue a STOP WORK order in the vicinity of the find;
2. Inform the Project Manager;
3. Install temporary site protection measures such as warning tape of avoidance signs-establishment of restricted area around the Chance Find;
4. Project Manager will record details (location and description) of the find and inform on-call archeologist;
5. Inform project personnel about Chance Find and restricted area;
6. The archeologist will document find perform a preliminary evaluation to determine whether the Chance Find is cultural heritage and if so, whether it is an isolate or part of a larger site or feature;
7. Artefacts should be left in place if possible; if materials are collected they will be placed in bags and labelled by an archaeologist and transported to the relevant agency. *Artefacts are not allowed to be taken by any Project personnel as personal possessions;*
8. The find should be documented via the use of photography, notes, GPS coordinates and maps, as appropriate;
9. If the Chance Find proves to be an isolated find or not of cultural heritage, the archeologist will authorize the removal of the site protection measures and the resumption of activity in the area;
10. If however, the archeologist confirms the Chance Find as a cultural heritage of significance, the relevant national authority will be informed within 3 days of that determination and initiate discussions about treatment;

11. Prepare and retain archaeological monitoring records including initial reports whether they are later confirmed or not. The record shall include coordinates of all observations to be retained by the project;
12. Develop and implement treatment plans for confirmed finds using the services of qualified cultural heritage experts;
13. If a Chance Find is a verified cultural heritage site, a final Chance Find report shall be prepared once treatment has been completed;
14. While investigation is on-going, there will be coordination with project personnel aimed at keeping them informed about the status of and schedule of the investigations into the chance find. Project personnel will also be informed as timing of the resumption of project activities in the vicinity of the find.

In the event that mitigation is required, then expedient rescue excavations should be undertaken by the relevant archaeological specialists unless the chance find is of international importance. If this is the case, then special care should be taken and archaeologists with the appropriate expertise in addressing the find should be appointed.

Details of all Chance Finds should be included in the reports submitted to the World Bank.