MINISTRY OF FINANCE, ECONOMIC PLANNING AND INFORMATION TECHNOLOGY

VOLCANIC ERUPTION EMERGENCY PROJECT

CONSULTANCY SERVICES FOR DESIGN AND CONSTRUCTION SUPERVISION OF BRIDGES IN LONDON (SITE-1), NOEL (SITE-2) AND OVERLAND (SITE-3)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT LONDON (SITE-1)

ECO REPORT NO: 14/2023

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LIST OF ACRONYMS

ACRONYM	MEANING
AOI	AREA OF INTEREST / AREA OF INFLUENCE
BRAGSA	ROADS, BUILDINGS AND GENERAL SERVICES AUTHORITY
CBD	CONVENTION ON BIOLOGICAL DIVERSITY
CBO	COMMUNITY-BASED ORGANISATION
CDB	CARIBBEAN DEVELOPMENT BANK
CDRRF	CARIBBEAN DISASTER RISK REDUCTION FUND
CITES	CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA
CPA	COUNTRY POVERTY ASSESSMENT
CWSA	CENTRAL WATER AND SEWAGE AUTHORITY
EHS	ENVIRONMENTAL, HEALTH AND SAFETY
ESA	ENVIRONMENTAL AND SOCIAL ASSESSMENT
ESCP	ENVIRONMENTAL AND SOCIAL COMMITMENT PLAN
ESF	ENVIRONMENTAL AND SOCIAL FRAMEWORK
ESIA	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT
ESMF	ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK
ESMP	ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN
ESS	ENVIRONMENTAL AND SOCIAL STANDARDS
EU	EUROPEAN UNION
GBV	GENDER-BASED VIOLENCE
GOSVG	GOVERNMENT OF ST. VINCENT AND THE GRENADINES
IDA	INTERNATIONAL DEVELOPMENT ASSOCIATION – WORLD BANK
IEE	INITIAL ENVIRONMENTAL EVALUATION
IUCN	INTERNATIONAL UNION FOR CONSERVATION OF NATURE
LGBTI	LESBIAN, GAY, BISEXUAL, TRANSGENDER OR INTERSEX
LPG	LIQUID PETROLEUM GAS
MCDMA	MULTI CRITERIA DECISION MAKING ANALYSIS
MOTW	MINISTRY OF TRANSPORT, WORKS, LANDS AND SURVEYS AND PHYSICAL PLANNING
NAP	NATIONAL ADAPTATION PLAN
NEMO	NATIONAL EMERGENCY MANAGEMENT OFFICE
OECS	ORGANIZATION OF EASTERN CARIBBEAN STATES
PAPS	PROJECT-AFFECTED PARTIES
PM	PARTICULATE MATTER
PWD	PERSONS WITH DISABILITIES
RC	REINFORCED CONCRETE
RH	RELATIVE HUMIDITY
ROW	RIGHT-OF-WAY
RPF	RESETTLEMENT POLICY FRAMEWORK
SDGS	SUSTAINABLE DEVELOPMENT GOALS (ALSO KNOWN AS THE GLOBAL GOALS)
SEP	STAKEHOLDER ENGAGEMENT PLAN
SIA	SOCIAL IMPACT ASSESSMENT
SPAW	PROTOCOL CONCERNING SPECIALLY PROTECTED AREAS AND WILDLIFE
SVG	ST. VINCENT AND THE GRENADINES
TCL	TRINTOPLAN CONSULTANTS LIMITED
TOR	TERMS OF REFERENCE

ACRONYM	MEANING
UNESCO	UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION
UNFCCC	UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE
VAC	VIOLENCE AGAINST CHILDREN
VEEP	VOLCANIC ERUPTION EMERGENCY PROJECT
VINLEC	ST. VINCENT ELECTRICITY SERVICES
VOCS	VOLATILE ORGANIC COMPOUNDS
WHO	WORLD HEALTH ORGANIZATION
WMP	WASTE MANAGEMENT PLAN
WPR	WATER POLLUTION RULES
XCD	EASTERN CARIBBEAN DOLLAR

GLOSSARY

TERM	APPLICABLE DEFINITION
Abutment	The portion of the bridge substructure at either end of a bridge which transfers loads from the superstructure to the foundation and provides lateral support for embankment.
Adverse Impact	Harmful effects on the environment that affects its physical, biological or social functioning.
Aggregate	Particulate Material used in construction including sand, gravel and crushed stone.
Ambient	Surrounding an organism or an object.
Aquatic	Relating to water.
Avifauna	Birds of a particular region, habitat or geological period.
Cofferdam	A watertight enclosure placed or constructed in waterbody (stream or river) to allow for construction of or repairs to a bridge structure.
Contaminate	Make (something) impure by exposure to or addition of a poisonous or polluting substance.
Climate Change	Climate Change refers to the shifts that can be attributed directly or indirectly to human activity that alter the composition of the global atmosphere, and which are in addition to natural climate variability observed over comparable time periods (Intergovernmental Panel on Climate Change, 2001)
Climate Change Adaptation	Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harms or exploits beneficial opportunities (Intergovernmental Panel on Climate Change, 2001).
Conservation	The wise use of a natural resource.
Critically Endangered	Extremely high risk of extinction in the wild.
Culvert	A conduit through which surface water can flow under or across a road.
Cumulative Impact	Impacts that may be compounded or increased over time by successive addition.

TERM	APPLICABLE DEFINITION
Dissolved Oxygen	Molecules of oxygen dissolved in water, needed by organisms that live in water.
Ecosystem	A complex set of relationships among the living resources, habitats, and residents of an area.
Effluent	Liquid waste or sewage discharged into a river or the sea.
Endangered	High risk of extinction in the wild.
Endemic	Refers to a species that is confined to a particular area for historical, ecological or physiological reasons.
Erosion	The wearing away of the land surface by running water, wind, ice or other geological agents.
Fault	The line along which two or more of the earth's crustal plates meet.
Fauna	The animals of a particular region, habitat or geological period.
Flora	The plants of a particular region, habitat or geological period.
Geofabric	A permeable tough synthetic geotextile, ideal for use in drainage, filtration, separation and protection.
Geotextile	Special fabric (which is rot-proof and permeable to water) which is used in 'geological' situations.
Groundwater	Water below the land surface in a zone of saturation.
Habitat	The natural home environment of an animal, plant or other organism.
Herpetofauna	Reptiles and Amphibians of a particular region, habitat or geological period.
Hydrogeology	The study of groundwater, including its origin, occurrence, movement and quality.
Isohyetal	A line drawn on a map connecting points having equal rainfall at a certain time or for a stated period.
Legislation	A proposed or enacted law or group of laws.
Mitigation Measures	Measures used to eliminate or minimize the severity of an on the natural or human environment.
Monitoring	Periodic or continuous surveillance or testing to determine the level of compliance with statutory requirements and/or pollutant levels in various media or in humans, plants, and animals.
Nearshore	Relating to or denoting the region of the sea or seabed relatively close to a shore.
Protected Area	A clearly defined geographical space, protected by special restrictions and laws for the conservation of the natural environment (UNEP).
Rare	The condition of a gene, species, population, community or ecosystem as being of lower abundance or occurrence than is desirable or expected according to N ecological principles.
Runoff	The draining away of water from the surface of an area of land.
Sewage	Waste matter (usually faecal matter)
Sewerage	Infrastructure/ system by which waste matter (sewage) is carried way in sewers and made harmless

TERM	APPLICABLE DEFINITION
Soffit	The underside portion of a deck slab overhanging the exterior of fascia girders of a bridge, or the crown of the culvert.
Stakeholder	A person, group, or organization that has direct or indirect stake in an organization because it can affect or be affected by the organization's actions, objectives, and policies.
Stakeholder Engagement	Stakeholder engagement refers to a broad, inclusive, and continuous process to engage persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively. Environmental Compliance Factsheet: Stakeholder Engagement in the Environmental and Social Impact Assessment (ESIA) Process (usaid.gov)
Stockpile	To acquire and store a large quantity of (something).
Terrestrial	Relating to earth, or living or existing on land rather than the sea
Topography	The relief features, land forms or surface configuration of a given area.
Turbidity	The degree to which water loses its transparency due to suspended particulates.
Vulnerable	High risk of endangerment in the wild.

LIST OF PREPARERS

This ESIA is being prepared in accordance with the Final Terms of Reference provided by the Ministry of Finance, Economic Planning and Information Technology of Saint Vincent and the Grenadines (SVG).

The following key professionals were involved in the preparation of this ESIA.

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- Ms. Joanne Reyes, Environmental Scientist;
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EXECUTIVE SUMMARY

This Environmental and Social Impact Assessment (ESIA) was done in support of the design and construction supervision of three bridges at London (Site-1), Noel (Site-2) and Overland (Site-3) located on the North Windward side of St. Vincent. This project is being undertaken by Trintoplan Consultants Limited (TCL) for the Ministry of Finance, Economic Planning and Information Technology of Saint Vincent and the Grenadines (SVG). Ecoengineering Consultants Limited was subcontracted by TCL to prepare this ESIA. This Environmental and Social Impact Assessment is specific to the construction of the London Bridge.

The proposed development of the new bridge at London, if implemented successfully, will bring long-term benefits to the residents of the Over-the-River communities. The development of new bridge infrastructure will improve community safety, maintain traditional land use, reduce the risk of isolation for residents, and prevent disruptions to their daily lives of residents.

DESCRIPTION OF THE WORKS

The preferred design solution for the London Bridge (Site-1) involves a reinforced concrete deck slab spanning between cast in place concrete abutments or supported on reinforced concrete beams. In addition to construction of the new bridge, channel improvements / scour protection works are also recommended.

Construction of the new bridge at London will involve the following:

- Construction of Bridge Abutments;
- Installation of Beams and Deck Slab; and
- Scour Protection.

Subsequent to construction of the new bridge at the London site, periodic clearing of the Agrika River channel will be undertaken to ensure the proper hydraulic performance of the structure. Other maintenance work will be carried out on the superstructure, bearings and expansion joints, substructure, scour protection, safety furniture following inspections; painting and waterproofing; and milling and reinstatement of the wearing surface.

DESCRIPTION OF THE NATURAL ENVIRONMENT

The proposed project site exists along the Windward Highway within the parish of Charlotte at Sandy Bay (London) on the northern windward / eastern side of St. Vincent. The bridge provides crossing over the Agrika River and provides connectivity to and from the villages to the north: Owia and Fancy.

Physical Environment

Climate

SVG experiences two distinct seasons: the wet season which generally occurs from June to December, and the dry season which generally occurs from January to May. However, it must be noted that the length of each season varies greatly depending on location. According to Saint Vincent's Environmental Profile (1991), annual rainfall in St. Vincent varies from approximately 1700 mm (67 inches) in dry coastal locations to 7000 mm (276 inches) in the wet central mountains. St. Vincent has an average monthly temperature of 27 °C with little diurnal or locational variation due to the dampening effect of the surrounding ocean. Temperature peaks in the rainy season, reaching a maximum of up to 31°C and drops as low as 23 °C in the dry season. In St. Vincent, RH is high throughout the year; above 70%. However, RH is higher during the rainy season than the dry season. The North-East Trade winds blow steadily across the island at approximately 15 to 25 knots most of the year.

Topography and Drainage

St. Vincent is roughly oval in shape with a central spine of mountains running from north to south with steep ridges radiating towards the east and west. The highest mountains (The Soufriere Mountains) are located to the north of the island. The proposed project site at London falls on the 50 ft contour.

Geology and Seismicity

The project site falls within the Soufriere Volcanic Centre which occupies the northern third of the island. It is the youngest and only centre considered to be active on the island. The close proximity of St. Vincent to the Caribbean Plate Margin makes the island vulnerable to considerable seismic activity.

Hydrogeology

The project site is located within the island's main aquifer unit. Groundwater sources have not yet been developed for public supply but studies are being conducted to investigate future exploration.

Soil Types

Generally, the soils of St. Vincent are readily erodible since they tend to be unconsolidated and friable. Three main soil types exist in St. Vincent. These include the following Volcanic Ash Soils, Yellow Earth Soils and Alluvial soils of the Coastal Plains and Valleys. The most dominant soil type is volcanic ash. Test pits, of depths 1.5 m and 2.5 m were excavated within the Agrika riverbed and at the elevation of the roadway. Soil stratigraphy within the test pits comprised mainly of sand and gravel.

Water Quality

Potential sources of contamination of the river include the following:

- Spills and leaks of hydrocarbons from vehicles;
- Run-off from roadside drains;
- Discharge from nearby residential homes;
- Littering/solid waste dumping; and
- Inflows of volcanic ash residue during heavy rainfall events.

It must be noted that during the dry season, flow within the river is minimal, however, during heavy rainfall events in the wet season, large volumes of water flow through the channel out to the sea on the eastern coast of the island into the Atlantic Ocean. Therefore, any contaminants released into the river are eventually transported into the nearshore marine environment due to the proximity of the site to the shoreline.

Air Quality

The main sources of air emissions noted at the project site include the following:

- Exhaust emissions from vehicles; and
- Kick up of dust/volcanic ash from vehicles.

Measured ambient concentrations of $PM_{2.5}$ and PM_{10} exceeded the respective 24-hour WHO Guideline limits.

Noise

The main sources of noise emissions noted at the project site include the following:

- Roosters crowing;
- Birds chirping;
- Vehicles traversing roadway;
- Wind;
- Waves crashing along coastline;
- Dogs Barking and;
- Insect Stridulation

Measured baseline noise levels exceeded World Bank Noise Guideline limits for residential areas.

Natural Hazards

St. Vincent is vulnerable to the following hazards:

- Volcanic Eruptions;
- Earthquakes and Tsunamis;
- Hurricanes and Other Storms; and
- Landslips and Rockslides.

Biological Environment

Terrestrial Flora

During field reconnaissance, floral species noted at the project site were Coconut *(Cocos nucifera),* Breadfruit *(Artocarpus altilis)* (see Photograph 4-2), Seaside Grape (Coccoloba unifer), Seaside Almond *(Terminalia catappa)*, Trumpet Tree *(Cecropia peltate)*, *(*Wild Ochro *(Abelmoschus sp.)* (see Photograph 4-3) and Banana *(Musa sp.)*.

Terrestrial Fauna

Fauna in SVG includes some species which are endemic to the island or endemic to the Caribbean region and species which have been introduced to the island by humans.

Avifauna

During field reconnaissance, bird species recorded at the project site included Bananaquit *(Coereba flaveola)*, Black-faced Grassquit (*Tiaris bicolor)*, Gray Kingbird (*Tyrannus dominicensis)*, Common Ground Dove *(Columbina passerine)*, Spectacled Thrush *(Turdus nudigenis)* and Magnificent Frigatebird *(Fregata magnificens)*.

Mammals

No direct surveys for mammals were conducted as part of this ESIA, it should be noted that there is potential for the presence of bats and non-volant species within agricultural and woodland areas close to the project site.

Herpetofauna

No direct surveys for amphibians and reptiles were conducted as part of this ESIA, it should be noted that there is potential for the presence of all native species of amphibians and reptiles at the project site mainly within agricultural and woodland areas close to the project site.

Invertebrates

Invertebrates in SVG includes 20 species of diplopods (centipedes and millipedes), 220 species of arachnids, not including microscopic mites, 2000 species of insects, 35 terrestrial crustaceans, and 75 species of terrestrial/freshwater molluscs.

Riverine Fauna

In addition to the 75 species of freshwater molluscs, 25 species of freshwater fish are found in SVG. During the field reconnaissance, no water was present in the Agrika River.

Marine Biodiversity

During the water quality monitoring exercise, Limpets and Zagaya Rock crabs (*Grapsus grapsus*) were observed on rocks at the outfall of the Agrika River.

Fisheries

The closest fish landing sites to the project site are situated in Sandy Bay, Owia and Fancy.

Turtle Nesting

While Sandy Bay is a popular nesting site, it is unlikely that turtles will come ashore at the outfall of the Agrika River, just downstream of the proposed London bridge as large rocks along the coastline make the area unsuitable for nesting.

Endemic, Rare or Threatened Species

The only endemic species recorded at the project site during field reconnaissance was the St. Vincent Anole (*Anolis trinitatus*).

Protected Areas

No protected areas are situated in close proximity to the project site and therefore they will not be affected by project activities.

Wildlife Reserves

There are no wildlife reserves situated in close proximity to the project site and therefore will not be affected by project activities.

Forest Reserves

The project site is situated along the northern segment of the Windward Highway and therefore is not within or in close proximity to any forest reserve.

Marine Conservation Areas

The Indian Bay/Villa/Calliaqua/Blue Lagoon is on mainland St. Vincent. This marine conservation area is situated on the southern coastline and therefore will not be affected by project activities.

DESCRIPTION OF THE SOCIOECONOMIC ENVIRONMENT

The conduct of community interviews/discussions and windshield surveys increased local awareness of the bridges subproject and provided opportunities for participating residents to share information on the existing community conditions, identify the subproject's potential impacts and express their requirements for bridge design.

Area of Influence (AOI)

The AOIs for direct impacts include the households, landowners, land users, and institutions, as well as community livelihoods and social and cultural activities that fall within or are close to the footprints of the project site and the associated infrastructure.

Historical and Cultural Development of the AOI Communities

The history of the North Windward communities, along with its cultural traditions and practices, is closely linked to the country's indigenous people. Today, most of the indigenous population of St. Vincent and the Grenadines reside in the AOI.

Locational Setting of the AOI Communities

Overland, Sandy Bay, Owia and Fancy are coastal communities in the North Windward region of St. Vincent and the Grenadines, accessible by land and sea. The distance between Overland and Fancy spans about 11.75 km, with Fancy the farthest village located 19.47 km (or an average of 42 minutes) from Georgetown or 50.21 km (or an average of 1.5 hours) from Kingstown.

Population Dynamics and Characteristics

According to the 2012 Population and Housing Census, the total population of the Sandy Bay Census Division stood at 2,576 persons and comprised 1,374 males and 1,232 females, with a gender ratio (male to female) of 1.09. The Sandy Bay population represented 2.4 percent of the total population of St. Vincent and the Grenadines.

Ethnicity

Persons of Mixed Ethnicity (42.7%) were the main ethnic group in the Sandy Bay Census Division, followed by Indigenous Peoples (38.4%).

Religion

Most persons residing in the Sandy Bay and Georgetown Census Divisions reported they were Christians.

Place of Birth

Most of the persons who are residents in the Sandy Bay and Georgetown Census Divisions were born there.

Sex of Head of Household

Of the 662 households in the Sandy Bay Census Division in 2012, 61 percent were headed by men, while women headed 39 percent.

Education and Demography

The 2012 Census data showed that in persons between ages 3 and 14 years, there were slightly more male students than female students who attended an educational institution (see Table 5-5). However, persons 15 years and older, there were more female students attending school when compared to male students.

Health Status and Demography

Of the chronic illnesses reported in St. Vincent and the Grenadines in the 2012 Census, the most prevalent non-communicable diseases were Hypertension, Diabetes, Asthma, and Arthritis.

Household Characteristics

A total of 37,000 households were recorded in St. Vincent and the Grenadines, according to the 2012 Population and Housing Census Report. With 662 households, the Sandy Bay Census Division had the lowest total household count of any Census Division, representing 1.8 percent of the national total of households.

Heads of Households

Heads of households in St. Vincent and the Grenadines were likely to be male and middle-aged in 2012. Nationally, male-headed households were prevalent, with approximately three male household heads for every two female heads.

Household Structure

Roughly 60 percent of persons older than 30 years old were the heads of their households in 2012 (57.9%). The older the individual, the more likely they lead their family; heads of households represented 45.3 percent of 30-44 year old, 63.7 percent of 45-64 year old and 73.1 percent of persons over 65 years old.

Land Use Acquisition

Land Tenure, Land Ownership, Rights and Uses

The total land area of St. Vincent and the Grenadines is roughly 96,000 acres. The State is a major landholder, owning approximately 60 percent of the total land area.

Forestry

Forestry accounts for 47 percent of land use, some 44,819 acres, in St. Vincent and the Grenadines. The country's climate, geology and topography, in combination with disturbances resulting from human and natural (volcanic, hurricanes, etc.) activity, have shaped ecosystems on the island.

Agriculture

Farming activities are concentrated further inland from the coast, primarily on the ridges of the surrounding mountainous terrain. The sandy soil prevalent in the area is conducive to cultivating a wide range of vegetables, including cabbage, carrots, sweet pepper, tomatoes, cucumbers, melons, squash, and, to a lesser extent, lettuce.

Cultural Characteristics and Resources

The communities within the social AOI are small farming and fishing communities with rich histories. The Sandy Bay area is predominantly composed of descendants of the indigenous Kalinago peoples (the Caribs) and the Garifunas (also referred to as Black Caribs), a mixture of Kalinago and Africans. None of the heritage resources falls within the right of way of the proposed bridges.

Economic Activities and Resources

St. Vincent and the Grenadines rely on agriculture, forestry, fisheries, and tourism as its main sources of income. In 2014, the services sector, which includes tourism, contributed 75.2 percent of the gross domestic product (GDP), followed by the industrial sector at 17.1 percent, and the agriculture sector at 7.8 percent. Historically, bananas were the single most important agricultural commodity, but its contribution to GDP, foreign exchange earnings, and employment has significantly declined. The tourism sector has shown significant dynamism between 2015 and 2019, with an average annual growth rate of 18.2 percent, as per data from the Eastern Caribbean Central Bank (ECCB).

Agricultural production took a big hit during the eruption of La Soufriere Volcano. While the local industry is recovering, farmers have reported that, except for plantain production, low prices have made it unprofitable to produce most crops at this time. High unemployment remains a persistent concern identified by residents as hindering the development of their communities. Women were mainly represented in professional and associate professional roles, retirees, homemakers, and the unemployed segments of the population.

Road Network

The road network in St. Vincent and the Grenadines consists of 515 miles and is composed largely of minor roads which provide access to rural and agricultural areas and, to a lesser extent, secondary and major roads. The transportation sector has been significantly impacted by the La Soufrière volcanic eruption. The Windward Highway (or Ebenezer Highway) and the Ivy Josua Highway are two of the five major roads in St. Vincent's road network, totally some 34 miles. The Windward Highway begins at Kingstown and ends at Rabacca where the Ivy Joshua Highway begins and ends at the village of Fancy.

Health Facilities and Conditions

There are four public health clinics located in Sandy Bay, Owia and Fancy. These clinics offer free health care services to residents during the weekdays, ranging from pharmacy services, anti- and post-natal services for pregnant mothers and women who have given birth, chronic disease clinic (Diabetes and Hypertension), daily dressings of wounds, family planning clinic, doctor's clinic and child health clinic.

Educational Infrastructure and Access to Education

The education status of a population is an important indicator of the social and economic development of an area. St. Vincent and the Grenadines has achieved universal access to education, which ensures that all persons of primary and secondary school age have equal educational opportunities, regardless of social class, gender, ethnicity or physical or mental disability.

Water Supply and Sanitation

The water catchments for the area are in Sion Hill (Sandy Bay), Owia, and Fancy, which are supplied mainly from surface water sources (rivers) situated on the slopes of the La Soufriere Volcano.

Access to Energy

Nationally, 88.9 percent of households relied on public electricity, showing an increase from 79.8 percent in 2001. Similarly, in Sandy Bay and Georgetown, 81.9 percent and 82.8 percent of households used electricity as their primary light source, respectively. The Census also indicated that there was a geographical disparity in electricity availability across the country, as areas farther away from the capital city tended to have lower access to public electricity.

Nationally, 93.8 percent of households used Liquid Petroleum Gas (LPG) as their main cooking fuel. In Georgetown, 91.7 percent of households utilized cooking gas, while in Sandy Bay, the figure was slightly lower at 88.2 percent.

Sports and Recreational Facilities

Sports play a significant role in recreational activities within the AOI, with cricket, netball, basketball, and football being prominent sports. Several parks, playing fields, and hard courts are available in the area for hosting sporting events. In London, the Pamenos Ballantyne Playing Field /London Playing Field and the Owia Salt Pond Recreational Park in Owia serve as green spaces and playing fields.

Safety and Security

Stakeholder discussions suggest crime and violence is an emerging concern for the Over-the-River communities. Some residents interviewed to date describe the area as calm and peaceful.

PROJECT IMPACTS AND MITIGATION MEASURES (NATURAL ENVIRONMENT)

The assessment of potential environmental impacts on the natural environment was undertaken in four (4) steps:

i. Identification of Potential Impacts (beneficial and adverse): based on review of general guidance documents and experience on other similar bridge construction projects;

ii. Establishing the Significance of these Impacts: this was done qualitatively using different degrees of sophistication in assessing different impacts. Where mitigation measures were recommended, the assessment assumes that these measures will be implemented;

iii. Classification of the Impacts: Low, Moderate or High on a structured basis based on three criteria – Extent, Intensity and Duration; and

iv. Assessment of Cumulative Impacts: taking into consideration ongoing and proposed projects including bridges at Noel and Overland, the Sandy Bay Defense Project and the North Windward Water Supply Project.

Construction Phase Impacts (Natural Environment)

The results of the analysis of the potential impacts on the natural environment of bridge construction at London (with mitigation measures) are summarized below:

- Low Potential Impact: Erosion, Slope Instability, Impaired Water Quality (Siltation), Impaired Water Quality (Hydrocarbon Spills and Leaks), Impaired Water Quality (Concrete Washings), Impaired Air Quality (Exhaust Emissions), Noise and Vibrations, Flooding, Soil Contamination, Artificial Lighting, Loss of Vegetation, Disturbance to Wildlife and Impacts to Nearshore Marine Ecosystems.

- Moderate Potential Impact: Impaired Air Quality (Dust) and Groundwater Contamination.

- The following impacts were Eliminated with mitigation measures – Impaired Water Quality (Toilet Waste), Improper Disposal of Solid Waste (Cleared Vegetation), Improper Disposal of Solid Waste (Demolition Rubble) and Improper Disposal of Solid Waste (Other Construction Solid Waste).

- The following impacts were assessed as Cumulative in relation to the potential impacts from other projects within the study area: Impaired Water Quality (Siltation), Impaired Water Quality (Hydrocarbon Spills and Leaks), Impaired Air Quality (Dust), Impaired Air Quality (Exhaust Emissions), Noise and Vibrations, Groundwater Contamination, Disturbance to Wildlife and Impacts to Nearshore Marine Ecosystems.

Maintenance / Operation Phase (Natural Environment)

The results of the analysis of the potential impacts on the natural environment of bridge maintenance/operation at London (with mitigation measures) are summarized below:

- Low Potential Impact: Impaired Water Quality (Siltation), Impaired Water Quality (Hydrocarbon Spills and Leaks), Impaired Air Quality (Dust), Impaired Air Quality (Exhaust Emissions), Noise, Disturbance to Wildlife and Impacts to Nearshore Marine Ecosystems.

- Moderate Potential Impact: and Groundwater Contamination.

- The following impacts were Eliminated with mitigation measures – Improper Disposal of Silt and Debris and Impacts to Nearshore Marine Ecosystems.

- No Cumulative Impacts were identified.

PROJECT IMPACTS AND MITIGATION MEASURES (SOCIAL ENVIRONMENT)

The approach to social impact analysis involves the following:

- Identification of social AOI: established as the community of Sandy Bay;

- Identification of project actions (during pre-construction, construction and maintenance/operation) which could lead to changes in the human environment;

- Identification of critical social factors and social impacts: based on the characterization of the AOIs social and development issues; and

- Evaluation of the magnitude of the impacts: Negligible, Minor, Moderate or Major using a qualitative system which recognizes the diverse circumstances among various population groups, which can often lead to distinct groups experiencing identical social impacts differently. The impact assessment considers the vulnerability of the AOI (to poverty, disasters, etc.) compared to the rest of the country and the vulnerability of local population subgroups within the area.

- Assessment of Cumulative Impacts: taking into consideration ongoing and proposed projects including bridges at Noel and Overland, the Sandy Bay Defense Project and the North Windward Water Supply Project.

Construction Phase Impacts (Social Environment)

The results of the analysis of the potential social impacts of bridge construction at London (with mitigation measures) are summarized below:

- Negligible Potential Impacts: Gender Violence and Sexual Harassment and Cultural Heritage Resources.

- Minor Potential Impact: Community Engagement and Relations, Local Employment and Livelihoods, Community Health and Safety, Damage to the Windward Highway, Traffic Delays, Under-representation of Women and Occupational Health and Safety Hazards for Women.

- Moderate Potential Impact: Land Procurement.

- Moderate Potential Impact: Local Employment and Livelihoods.

- The following impacts were assessed as Cumulative in relation to the potential impacts from other projects within the study area (including bridges at Noel and Overland, the Sandy Bay Defence Project and the North Windward Water Supply Project): Land Procurement, Community Engagement and Relations, Local Employment and Livelihoods, Traffic Delays, Gender Violence and Sexual Harassment and Cultural Heritage Resources.

Maintenance / Operation Phase Impacts (Social Environment)

The results of the analysis of the potential social impacts of bridge maintenance/operation at London (with mitigation measures) are summarized below:

- Negligible Potential Impacts: Traffic Volumes and Community Health and Safety.

STAKEHOLDER CONSULTATION

Using the approach applied in the VEEP SEP, stakeholders for the bridge subproject at London are categorized into three categories: a) subproject-affected parties, b) other interested parties, and c) vulnerable groups. Based on the VEEP SEP, stakeholders were analyzed based on their level of importance to the Subproject (low, medium, high) versus their influence on the outcome of the Subproject. A total of 55 interviews and discussions were carried out, consisting of 20 institutional interviews and 35 individual interviews and focus group discussions within the AOI. Numerous individuals, totalling 115 (44 men and 71 women), actively participated in this process.

The five issues most identified by community stakeholders were economic in nature, in contrast to the economic and social concerns identified by institutional stakeholders. Unemployment was by far the most identified concern reported by both community and institutional stakeholders, with youth unemployment singled out as a major development concern. The unemployment situation was said to have been exacerbated by the eruption of La Soufrière and the COVID-19 pandemic.

Overall, there is a high level of community acceptance of the Subproject, with residents overwhelmingly indicating that it would be beneficial to the communities in terms of improved access, increased traffic to local events and attractions and creation of job opportunities. Based on their experiences, residents offered several considerations for bridge design which were considered.by the Design Team.

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Eco Report No:14/2023 **Revised April 09, 2025**

MINISTRY OF FINANCE, ECONOMIC PLANNING AND INFORMATION TECHNOLOGY

CONSULTANCY SERVICES FOR DESIGN AND CONSTRUCTION SUPERVISION OF BRIDGES IN LONDON (SITE-1), NOEL (SITE-2) AND OVERLAND (SITE-3)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT: LONDON (SITE-1)

1 INTRODUCTION

1.1 Authorization and Layout

Trintoplan Consultants Limited (TCL) was contracted by the Ministry of Finance, Economic Planning and Information Technology of Saint Vincent and the Grenadines (SVG) to undertake consultancy services for the design and construction supervision of three bridges at London (Site-1), Noel (Site-2) and Overland (Site-3), located on the North Windward side of Saint Vincent (see Figure 1-1). TCL sub-contracted Ecoengineering Consultants Limited to prepare this Environmental and Social Impact Assessment (ESIA) for the construction of these bridges. This ESIA, specific to the bridge construction at London (Site-1), follows an initial environmental evaluation including an Environmental and Social Screening Checklist and an Environmental and Social Scoping Report.

This ESIA consists of eight chapters and six appendices. The remainder of this introductory chapter provides the background and purpose of the project. Chapter 2 provides a description of the project and discusses alternatives considered whilst chapter 3 outlines the legal and institutional framework which will guide this project. Chapters 4 and 5 present the description of the natural environment and the socioeconomic environment respectively. Chapters 6 and 7 discuss potential impacts on the natural environment and the human environment which may arise from project related activities. and recommends mitigation measures to reduce/address these concerns. Finally, Chapter 8 provides a record of stakeholder consultations performed during the study. On this project, an Environmental and Social Management Plan has been prepared as a separate document.

1.2 Background

The Government of Saint Vincent and the Grenadines (GoSVG) has received financing from the International Development Association - World Bank (IDA) toward the cost of the Volcanic Eruption Emergency Project (VEEP) and intends to apply part of the proceeds of this loan to payments for goods, works, non-consulting and consulting services to be procured under this project. The Ministry of Transport, Works, Lands and Physical Planning (MoTW) in collaboration with the Roads, Buildings and General Services Authority (BRAGSA) has identified a number of priority investments to reduce the country's physical and economic vulnerability to adverse natural events.

As such, one of the priority investments is the construction of three (3) permanent bridges in London (Sandy Bay), Noel (Sandy Bay) and Overland which are located on the North Windward side of the island. These two-lane bridge systems with foot walks are to be used to maintain continuous access from one village to another, cross uneven ground, and ford obstacles so that residents can conduct their daily activities without disruptions.

This ESIA is prepared for the bridge at London as it is likely that the construction of this bridge will be the first to be tendered.

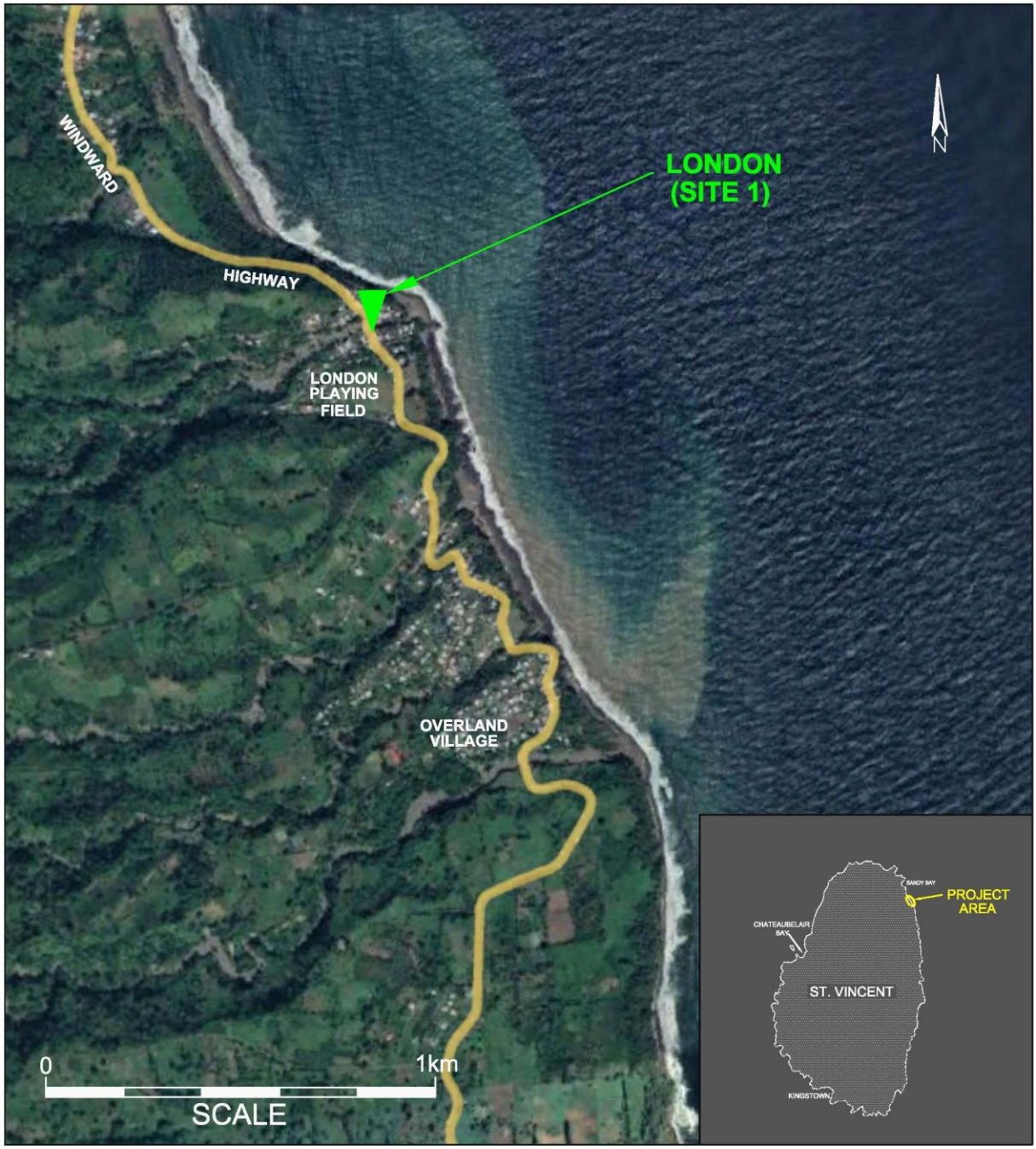

FIGURE 1-1: PROPOSED PROJECT SITE

1.3 Purpose

As explained in TCL's Conceptual Design Report dated April 2024, the original crossing at the London Bridge is an 8 m span x 5 m wide box culvert with a soffit approximately 3 m above the existing riverbed (see Photograph 1-1). This river has had a history of overtopping and blockage during storm events. Therefore, the waterway opening area is currently inadequate to accommodate the stormwater flows and the lahar flows. A new bridge of an adequate size is therefore needed to accommodate the runoff anticipated from the design storm events.

The new two-lane bridge system with foot walks is one of the three bridges planned for the North Windward area (see Section 1.2, above).

PHOTOGRAPH 1-1: EXISTING BRIDGE AT LONDON

2 DESCRIPTION OF THE PROJECT

2.1 Proposed Project

2.1.1 Design

A Reinforced Concrete Deck Slab spanning between cast in place concrete abutments or supported on reinforced concrete beams is proposed for the London site (see Figures 2-2 and 2-3 respectively). The bridge, 15 m wide, clear span with a minimum clear depth of 3 m will be constructed downstream of the existing culvert crossing. In addition to construction of the new bridge, the following channel improvements/ scour protection works are recommended:

- Concrete lining under bridge as well as 100 m upstream and 50 m downstream for a width of 15 m and side walls of 2.5 m high.

- River training works downstream of the bridge along the southern bank only, to protect the existing structures.

- River training work upstream.

- Wing walls to be included to match upstream and downstream channel improvement works.

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FIGURE 2-1: CONCEPTUAL DESIGN LAYOUT

Conceptual Design Layout- London

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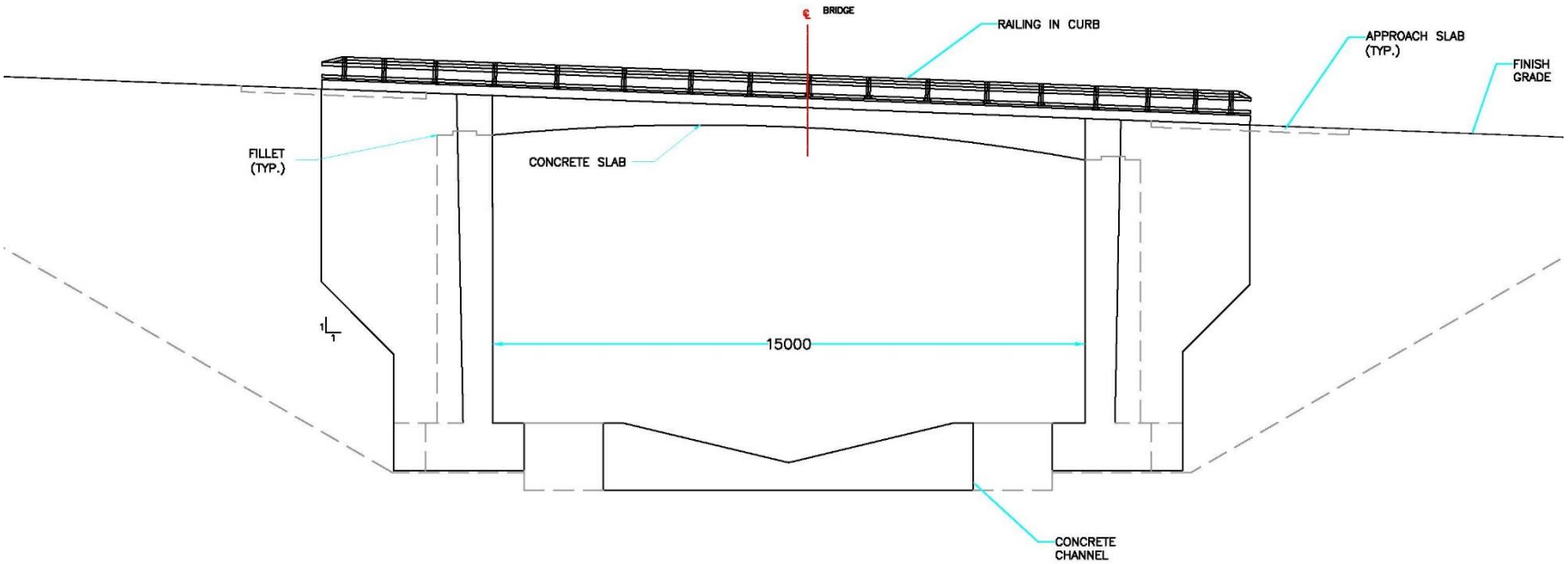

FIGURE 2-2: CROSS SECTION OF TYPICAL CONCRETE SLAB SPANNING BETWEEN CONCRETE ABUTMENTS

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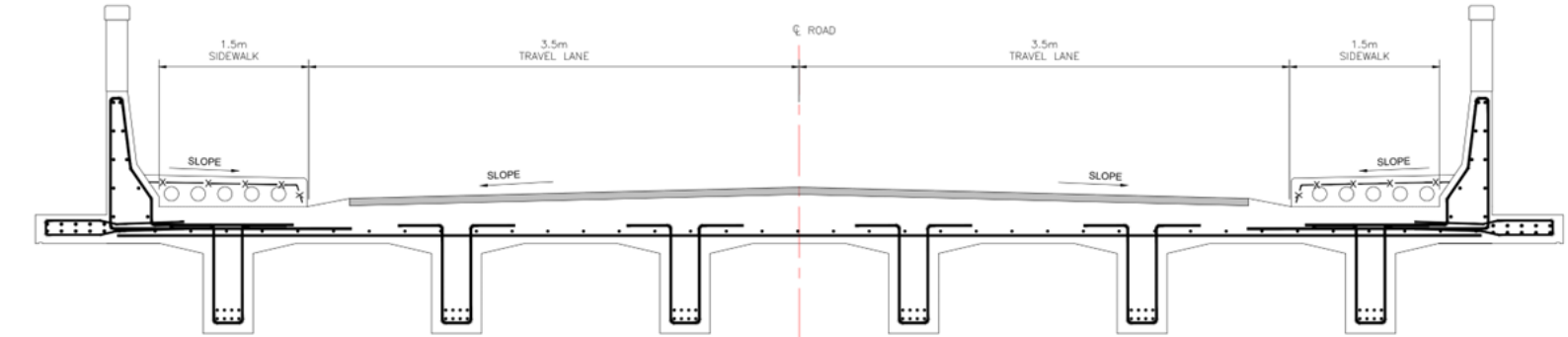
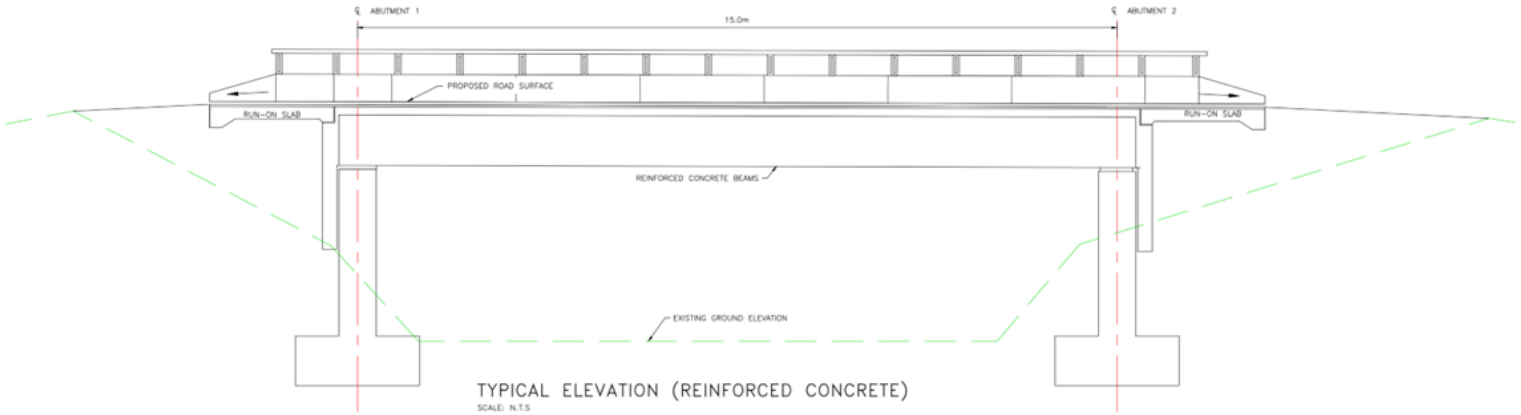


TYPICAL BRIDGE DECK SECTION (REINFORCED CONCRETE)
SCALE: N.T.S



TYPICAL ELEVATION (REINFORCED CONCRETE)
SCALE: N.T.S

FIGURE 2-3: CROSS SECTION OF TYPICAL CONCRETE DECK SLAB ON CONCRETE BEAMS

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2.1.2 Likely Construction Methods

Construction of the new bridge at London will involve the following:

- Construction of Bridge Abutments
- Installation of Beams and Deck Slab
- Scour Protection

2.1.2.1 Construction of Abutments

Construction of Abutments will begin with the demolition of the existing concrete retaining wall along the southern bank, downstream of the existing crossing. Abutments will be constructed on shallow footings/foundations (see Figure 2-4) at this site. To construct the abutments, flow in the river must be obstructed/altered upstream and downstream of the work area using cofferdams across the watercourse to create a dry working area (see Figure 2-5).

Once the cofferdams have been created, the riverbank will be excavated to the depth of the base, and a lean concrete layer will then be poured over the base. Reinforcing steel will be brought to the site, cut and bent to size and shape, then placed in the excavated area. Concrete will either be mixed on site or brought to the site in mixer trucks and poured into the excavation to create a base slab. The steel reinforcement will then be extended upward to the top of the abutment, and formwork will be installed to the required dimensions of the abutment. A perforated drainage pipe will be installed directly behind the stem of the abutment at the bottom of a granular drainage blanket at an elevation just above highest astronomical tide to reduce the buildup of hydrostatic pressures on the bridge abutment. The perforated drainage pipe will discharge through the wingwalls. Concrete will be poured into the formwork in layers, and each layer will be densified using vibrators before the next layer is poured. The concrete will be cured until the specified strength is achieved, after which the formwork will be removed. The excavated space behind each abutment will then be backfilled with select granular material imported to the site. The existing excavated material will be used as backfill beyond the limits of the selected granular material.

2.1.2.2 Installation of Beams and Deck Slab

Concrete is the preferred construction material over steel because of the risk of bridge failure due to the likelihood of corrosion caused by the sea blast. Following the construction of abutments, the beams and deck slab will be constructed of reinforced concrete. Formwork and reinforcing steel will be brought to the site, via flatbed trucks. The bridge beams will then be cast in-place, following concrete works described above for abutments. When the bridge beams have sufficiently cured, the deck slab will be installed using similar methods.

For a deck spanning between cast in place concrete abutments, where the design does not include beams, the deck slab of the required span will also be constructed using a similar method as described above.

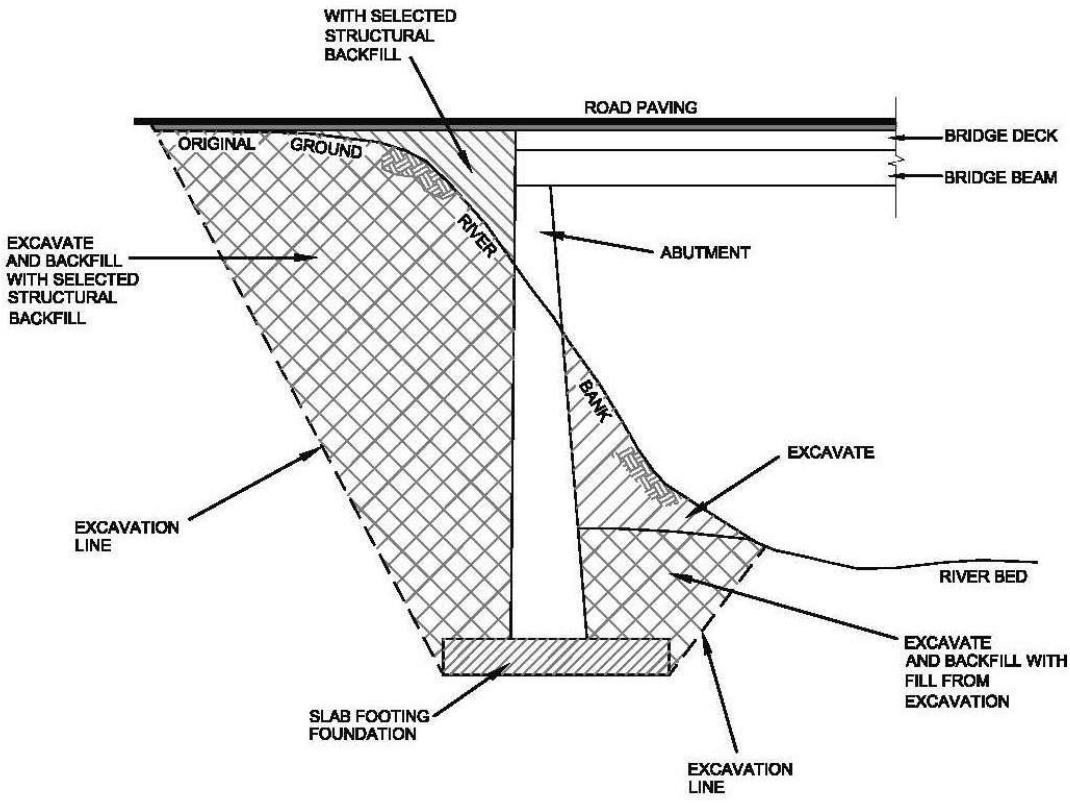
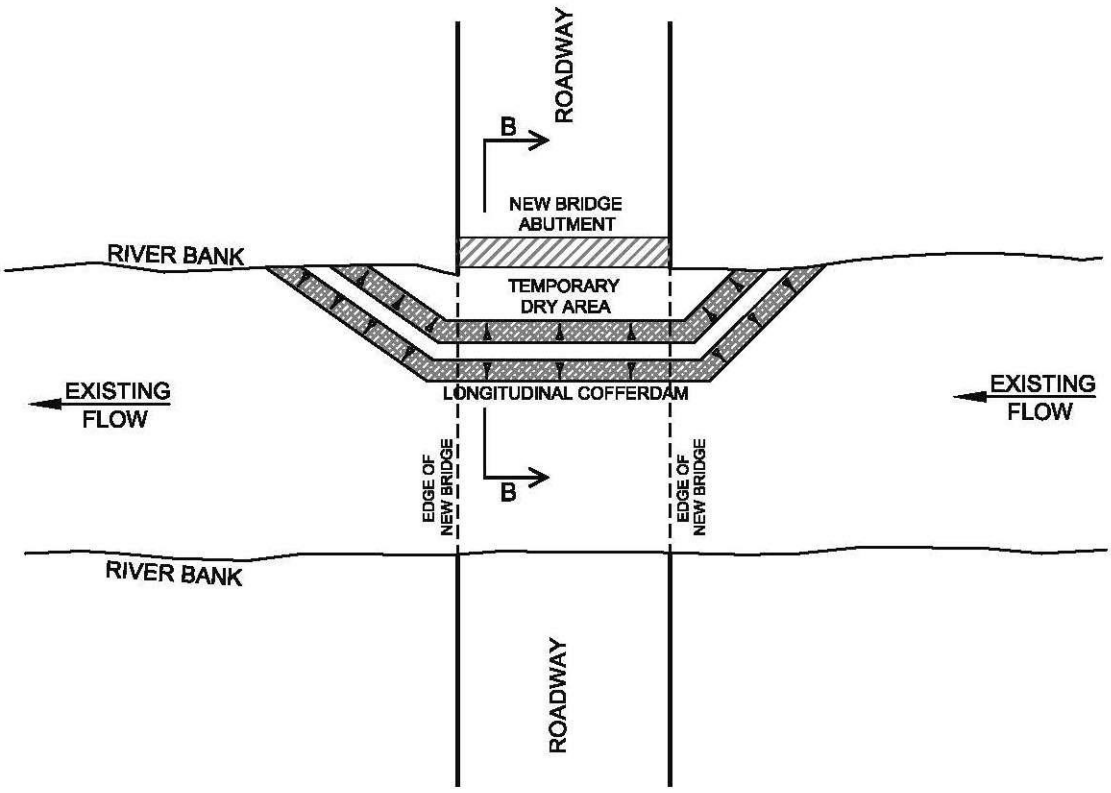
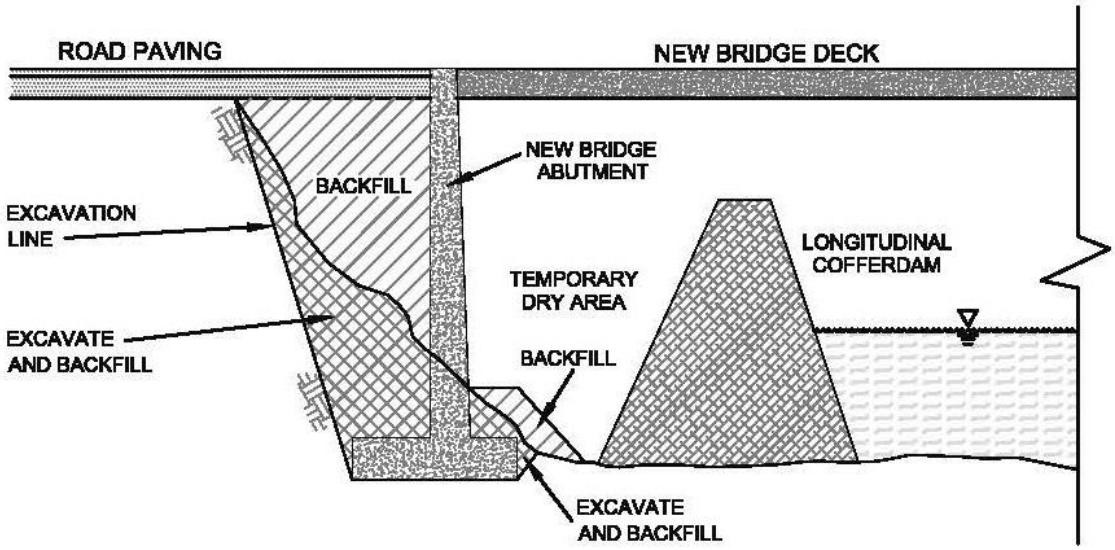


FIGURE 2-4: ABUTMENT ON SHALLOW FOUNDATION





SECTION B-B

FIGURE 2-5: LONGITUDINAL COFFERDAM

2.1.2.3 Scour Protection/ Channel Improvements

In addition to construction of a new bridge at London, scour protection and channel improvement works are also proposed upstream and downstream of the proposed bridge alignment. This will involve the river training works in the form of reinforced concrete channel walls, rock revetment, masonry stone protection or rip rap structures. The likely construction method for each of these structures is described under the following headings:

- Reinforced Concrete Wall;
- Rock Revetment;
- Masonry Stone Protection and;
- Rip Rap

2.1.2.3.1 Reinforced Concrete Channel Wall

Construction of a Reinforced Concrete Channel Wall typically begins with excavation of the ground surface to the desired depth. Excavated soil will be temporarily stored at the site for beneficial reuse as backfill. Steel reinforcement and formwork will be installed to the required dimensions. PVC pipes will also be placed between the two faces of the formwork to form weep holes. The wall will then be cast in-place using methods described in Section 2.1.2.1 for abutments. The space behind the wall will then be backfilled as described in Section 2.1.2.1. Figure 2-6 below shows a typical cross section of a reinforced concrete channel wall.

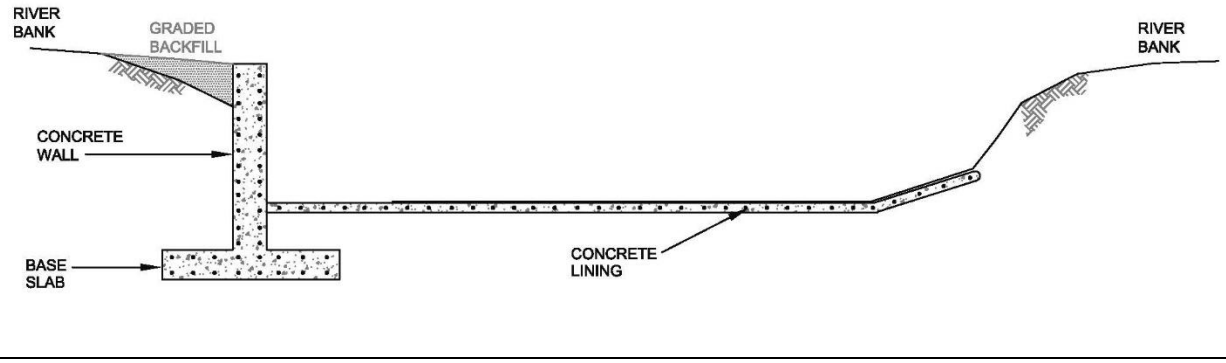


FIGURE 2-6: TYPICAL CROSS SECTION OF REINFORCED CONCRETE CHANNEL WALL

2.1.2.3.2 Rock Revetment

The area for construction will be prepared by removing vegetation and the top layer of soil using bulldozers. Previously selected rock and geotextile will be transported to the site. Geotextile will then be placed on the prepared area upon which rocks will be placed to a specified height, using excavators. Figure 2-7 below shows a typical cross section of a rock revetment.

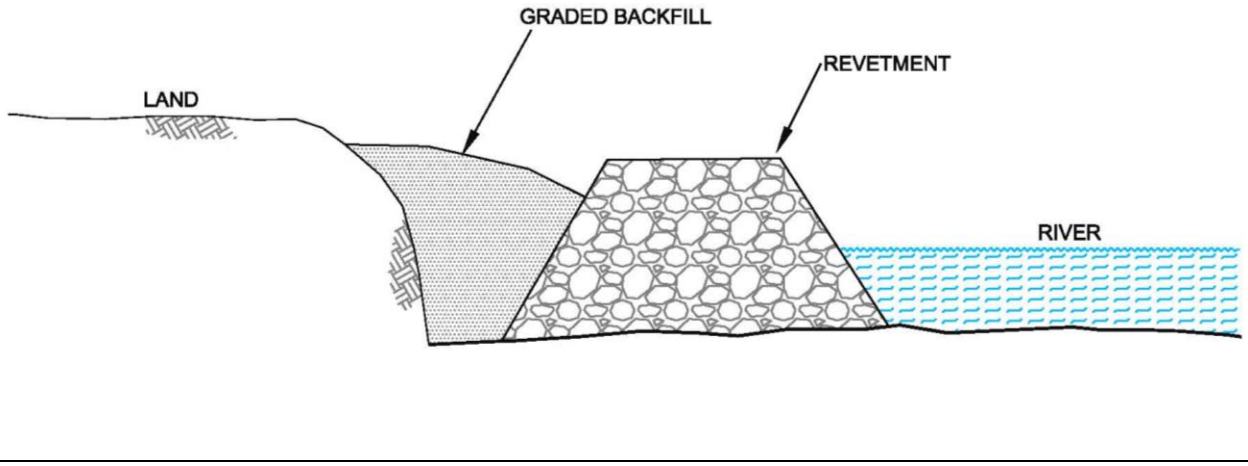


FIGURE 2-7: TYPICAL ROCK REVETMENT

2.1.2.3.3 Masonry Stone Protection

Similar to the construction of a reinforced concrete channel wall described in Section 2.1.2.3.1, work will begin with the excavation for the base of the wall. The base slab will then be cast in-place, and the wall will be constructed of stone and mortar. The space behind the wall will then be backfilled as described in Section 2.1.2.1. Figure 2-8 below shows a typical cross section of a masonry stone wall.

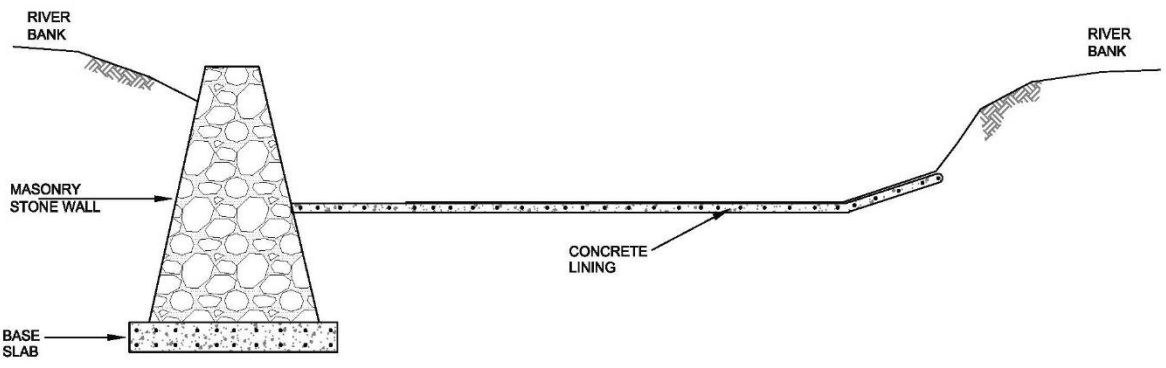


FIGURE 2-8: TYPICAL CROSS SECTION OF MASONRY STONE WALL

2.1.2.3.4 Rip Rap

The area where rip rap will be installed will firstly be cleared of large rocks and vegetative debris and will then be excavated to the required depth using excavators. Geofabric and rocks will be brought to the site. Geofabric will be spread manually on the slopes. A layer of smaller rock will then be placed and compacted after which, a layer of larger rock will be placed and infilled with concrete. Figure 2-9 below shows a typical cross section of rip rap protection.

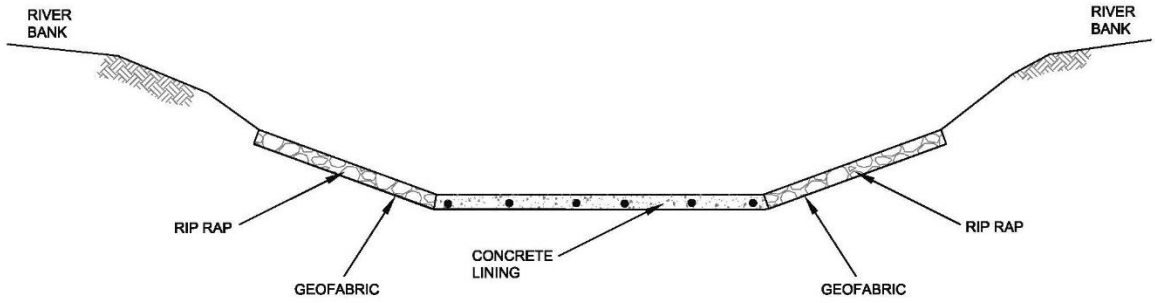


FIGURE 2-9: TYPICAL RIP RAP

2.1.3 Maintenance / Operation

Subsequent to construction of the new bridge at the London site, maintenance works will be undertaken periodically to ensure the proper hydraulic performance of the structure. These works will include the following:

- Cleaning of the Agrika River channel to remove solid waste, vegetative debris and silt every 3 to 6 months. Such cleaning will also be undertaken after heavy rainfall events and/or lahar flows. Equipment such as excavators and bulldozers will be used to remove material from the channel. The excavated material will be loaded onto dump trucks and transported to an approved disposal site.

- Inspection of superstructure (deck slab, parapet walls etc.) every 2 years. In the event that any cracks are encountered, they will be sealed.

- Inspection of bearings and expansion joints, every 2 years. Any required repairs shall be undertaken promptly.

- Inspection of substructure (abutments, foundation, beams etc.) every 2 years. In the event that any cracks are encountered, they will be sealed.

- Inspection of scour protection every 2 years. In the event that any cracks are encountered, they will be sealed.

- Inspection of bridge safety furniture (reflectors, guard rails, warning signage, etc.) every 2 years. Any required repairs shall be undertaken promptly.

- Painting and waterproofing every 5 years.

- Milling and reinstatement of wearing surface every 10 years.

2.2 Alternatives Considered

The following project alternatives were considered during the development of the design of the new bridge to be constructed at London:

- No Action
- Structural Options

2.2.1 No Action Alternative

The existing crossing at the London Bridge is an 8 m span x 5 m wide box culvert with a soffit approximately 3m above the existing riverbed. This river has had a history of overtopping and blockage during storm events. Therefore, the waterway opening area is currently inadequate to accommodate the stormwater flows and the lahar flows. A new bridge of an adequate size is therefore needed to accommodate the runoff anticipated from the design storm events. If not replaced, river overtopping and blockage will continue into the future and may become worse, thereby resulting in further damage to bridge structure, further economic losses (from damage to residential dwellings, disruption of business activities) due to the temporary loss of access to and from the villages north of the London bridge.

2.2.2 Structural Options

The Terms of Reference provided by the Ministry of Finance, Economic Planning and Information Technology specified that as a minimum, the bridge should be double lane, clear span bridge with a 7 m wide deck plus a protected 1 m wide raised sidewalk with handrails. Additionally, the design should accommodate internal, protected utility runs for water, electrical, and fiber optic cable services. The bridge span and deck height should be designed to meet the outputs of the hydrological and hydraulic studies. The deck height should permit continuous use during at least a 1:50-year storm event.

Four options were identified for each bridge based on an assessment of hydrological, geotechnical, environmental and social factors.

- Option A – Reinforced Concrete (RC) deck slab supported on pre-cast prestressed concrete beams.

- Option B – RC deck slab supported on post tensioned concrete beams.

- Option C – RC deck slab supported on structural steel beams.

- Option D – RC deck slab supported on cast in place reinforced concrete beams.

The various options were subject to a Multi Criteria Decision Making Analysis (MCDMA) to weigh each option and thus determine the preferred option. The MCDMA was based on the following criteria which were developed through an understanding of the project objectives:

- Land Acquisition or Easement Required
- Construction Duration
- Simplicity of Construction and Construction Material
- Local Material Content
- Environmental Considerations
- Long Term Maintenance Requirements
- Social Considerations
- Local Manpower Content
- Economic Feasibility

The details of this analysis are contained in the Conceptual Design Report prepared by Trintoplan Consultants Limited dated November 2023 and a summary of the output of the MCDMA is provided below for the London site.

Bridge Location	Structural Option			
	A	B	C	D
London	70	69	62	78

Based on the outcome of the MDCMA, the most appropriate solution is the RC Deck Slab supported on cast in place reinforced concrete beams which had the highest score. Therefore, Option D is the recommended option to be taken to final design.

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3 LEGAL FRAMEWORK

This chapter summarizes the legislative and regulatory framework which will guide the construction of the new bridge at London under the following headings:

- National Policies;
- National Legislation;
- Regional and International Guidelines and
- International Treaties, Conventions and Agreements.

3.1 National Policies

3.1.1 National Physical Development Plan

The National Physical Development Plan, 2021-2041, provides a framework to guide physical/spatial development in SVG. The plan sets objectives for the future growth and development of the country with a 20-year horizon and establishes policies and provisions to guide future development by informing the public, business and government sectors of the type, form, scale and location of development, and those areas in need of protection and conservation measures.

The Plan will also be used by the Physical Planning and Development Board and the Physical Planning Unit when considering applications for permission for development proposals.

The construction of the new bridge at London aligns with the following objectives of the plan:

- **Better access to places and services:** *Improve accessibility to places and services by combining efficiently connected land, sea and air transport, and fast, reliable digital networks.*

- **Building where it's safe, and building for durability and recovery:** *Locate, shape and equip settlements to minimize hazard risks and enable communities to recover quickly, rebuilding or relocating as appropriate.*

3.1.2 National Economic and Social Development Plan

The National Economic and Social Development Plan, 2013-2025 envisages the continued development and strengthening of national institutions and the necessary technical and administrative capacity to deal with threats, in order to capitalize on opportunities presented. The plan is themed "Re-engineering Economic Growth: Improving the Quality of Life for all Vincentians" and is advanced by the following five strategic goals:

1. Re-engineering Economic Growth.
2. Enabling Increased Human and Social Development.
3. Promoting Good Governance and Increasing the Effectiveness of Public Administration.
4. Improving Physical Infrastructure, Preserving the Environment and Building Resilience to Climate Change.
5. Building National Pride, Identity and Culture.

The construction of the new bridge at London is in keeping with Goal 4 of this plan.

3.1.3 National Adaptation Plan

The National Adaptation Plan (NAP) for the period 2018 to 2030 was formulated in 2019 with the aim of guiding SVG towards a green, low-emission and climate resilient development pathway. The main objectives of the NAP are to reduce vulnerability to the impacts of climate change by building adaptive capacity and resilience, and to facilitate the coherent integration of climate change adaptation into new and existing policies, programmes and activities.

The construction of the new bridge at London, is in keeping with the following objectives of the NAP:

- *To promote an enabling environment to facilitate the mainstreaming of climate change adaptation in the planning, budgeting and implementation processes, by strengthening the governance structures to enhance synergies between adaptation and disaster risk reduction, including the identification, implementation, monitoring and evaluation and communication of adaptation actions;*

- *To implement adaptation actions toward an increased resilience of the most vulnerable Vincentians.*

3.1.4 National Climate Change Policy

The National Climate Change Policy of SVG 2019, provides overarching guidance for building resilience and mainstreaming climate change into the national development agenda for low carbon and sustainable growth.

This policy includes an overview of the national circumstances and context, including observed and future climate change trends and impacts, and the policy framework for use in climate change planning and decision-making. It identifies priorities for action for the period 2018-2030 including specific objectives for adaptation, mitigation and cross-cutting areas. It is aligned with the National Economic and Social Development Plan (2013-2025) as well as the NAP (2018-2030) that guide climate change adaptation and mitigation, respectively. It also seeks to build on existing policies, institutional structures and initiatives across sectors to ensure an integrated, cross-sectoral approach to build climate change resilience in SVG.

The construction of the new bridge at London aligns with the adaptation objective of this policy; *"To reduce vulnerability to the impacts of climate change in SVG through building adaptive capacity and resilience, especially among the most vulnerable populations".*

3.2 National Legislation

National Legislation which will guide the construction of the new bridge at London, include:

- Town and Country Planning Act,1992;
- Environmental Health Services Act, 1991;
- Waste Management Act, 2000;
- Litter Act, 1991;
- Wildlife Protection Act, 2002;
- National Parks, Rivers and Beaches Act, 2002;
- Forest Resource Conservation Act, 1992;
- Fisheries Act, 1986;
- Central Water and Sewerage Authority Act, 2007;
- National Trust Act, 1969 and
- Noise Control Act 2019.

3.2.1 Town and Country Planning Act, 1992

The Town and Country Planning Act No, 45 of 1992 is the most important environmental management related legislation in SVG. The objective of this act is to enable orderly and progressive development of land, proper planning and development control. The Physical Planning and Development Board was established under this Act. The main functions of the Board are as follows:

- To institute and maintain a study of town and country development;
- To prepare national, regional, and local development plans to the Minister for approval by Cabinet; and
- To control land development.

Section 16 of the Town and Country Planning Act states that no development shall be carried out except under and in accordance with the conditions of a grant of permission for development from the Physical Planning and Development Board. This project will require approval from the Physical Planning and Development Board prior to commencement of works. The Board will review the ESIA and development applications as well as oversee all other development control related matters for the proposed works, from inspection, to monitoring and enforcement.

The grant of permission for development shall be determined by the Board after considering:

- The approved national, regional and local plans;
- An approved development plan applicable to the land to which the application relates;
- An approved Environmental Impact Statement in respect of the application

This process will be applied to the establishment of the bridge at London.

3.2.2 Environmental Health Services Act, 1991

This Act makes provision for the conservation and maintenance of the environment in the interest of general public health and highlights the responsibility of such to belong to the Minister/Ministry of Health and the Environment. This Act established the Environmental Health Board and the Environmental Division. The functions of the Division include:

- Investigating problems and instituting preventative / remedial measures in respect of environmental pollution, the management and disposal of solid waste, waste, effluents, gaseous emissions, nuisances, pests, and general sanitation.
- Conducting research studies and monitoring programmes related to environmental pollution, solid waste management, effluent, gaseous emissions etc.

- Gathering, collating, analyzing, publishing and disseminating information relevant to environmental pollution, the management and disposal of solid waste, waste effluents, gaseous emissions, nuisances, pests, and general sanitation.
- Promoting the planning, approval, funding and implementation of measures designed to ensure the wise and safe use of the environment.
- Training persons involved in environmental health services;
- Carrying out surveys, monitoring and investigations and preparing the necessary reports, plans and programmes.
- Maintaining and operating the necessary laboratory analytical and inspection facilities.
- Providing advice in the field of environmental health and other supportive services to the Ministry and other Government Agencies in SVG.
- Implementing and administering approved programmes.

Section 10 of this act stipulates that no person shall construct, alter, extend or replace any plant, structure, equipment, apparatus, mechanism that may emit or discharge, or from which may be emitted or discharged a contaminant or pollutant into any part of the environment unless he/she has first obtained a certificate of approval issued by the Chief Environmental Health Officer.

The Chief Environmental Health Officer shall grant a certificate of approval once satisfied with the proposed method to control or prevent the discharge of pollutants into the environment or if not so satisfied shall refuse to grant the certificate. Furthermore, the Chief Environmental Health Officer may revoke a certificate if the holder has failed to comply with the conditions subject to which the certificate was granted.

Section 11 states that no person shall dump garbage/refuse in any public place or open space or create conditions that are unsanitary, constitute a nuisance, and contribute to pests or other vermin.

Therefore, the construction of the proposed bridge at London must comply with this legislation, particularly as it relates to the potential impairment of water quality and the management of waste during the construction phase.

3.2.3 Waste Management Act, 2000

The Waste Management Act, 2000 was enacted to provide for the management of solid waste in conformity with best environmental practices. This Act established the Solid Waste Management Authority which is responsible for the collection, treatment, reutilization, and disposal of solid, non-hazardous waste and quarantine waste.

Key Provisions of the Waste Management Act relevant to the construction of this bridge at London are:

- Section 19: no person is allowed to deposit or knowingly cause the deposition of solid waste in or on any land, beach, foreshore, marine waters or river banks or to treat, keep or dispose of solid waste in a manner likely to cause pollution of the environment or harm human health.

- Section 25, no person is permitted to transport waste in the course of business unless that person is the holder of a current waste haulage permit issued by the Minister.

- Section 36, any person who conducts industrial, commercial, or institutional operations in the course of which waste is generated shall make his own arrangements for waste management, and shall ensure that any waste generated does not present a risk to human health, safety or the environment.

- Section 37, every occupier of premises in which waste is at any time stored shall store that waste in containers that prevent the escape of water, liquids or objectionable levels of odour, and which prevent infestation by pests or vermin.

This Act is supported by the Solid Waste Management Regulations 2006, which establishes the national standards for handling specially categorized solid waste and stipulates the need for obtaining licenses and permits by private waste management operators.

Therefore, the Contractor responsible for undertaking the proposed works at London must adhere to the Waste Management Act, 2000 and Solid Waste Management Regulations of 2006 to ensure proper waste management and disposal procedures are implemented during the construction phase. Solid waste from this project will be transported to the Diamond Landfill.

3.2.4 Litter Act, 1991

The Litter Act 1991, declares littering an offence and outlines the penalty for committing the act and the administrative process. According to this legislation, litter includes any refuse, animal remains, rubbish, garbage, bottles, tins, glass, paper, plastic, containers, debris, dirt, filth, rubble, sawdust, ballast, stones, derelict vehicles, cartons, packages, packing and packaging materials, earth, human or animal excrement, urine, noxious or offensive liquid or substance or waste matter or any other matter likely to deface, make untidy, obstruct or cause a nuisance;

Therefore, on this project, the Contractor can be held liable for improper disposal of construction and other waste generated at the London project site.

3.2.5 Wildlife Protection Act, 2002

This Act provides for the preservation of wildlife in SVG. It proclaims that all wildlife species found in the multi-island state are the property of the Crown. This legislation provides for regulated hunting and possession of animals, declaration of wildlife reserves and their management as natural areas and the appointment of a Chief Wildlife Protection Officer and other specific officers to carry out enforcement actions.

The first schedule of this Act declares 24 Wildlife Reserves. These consist of 8 areas in St. Vincent and 16 areas in the Grenadines. The largest and most important of these is the 7,596 acre (3075 ha) St. Vincent Parrot Reserve in the central mountain range of St. Vincent which is intended to protect the endangered St. Vincent Parrot *(Amazona guildingii).*

Other wildlife reserves in St. Vincent include in the King's Hill Forest Reserve, the Falls of Baleine, the Botanical Gardens and adjacent grounds of Government House and four offshore islands, the largest of which are Chateaubelair Islet and Young Island off the Northwestern and Southern coast respectively.

It should be noted that none of these wildlife reserves are situated in close proximity to the London project site and therefore will not be affected by project activities.

3.2.6 National Parks, Rivers and Beaches Act, 2002

The National Parks, Rivers and Beaches Act makes provision for the preservation, protection, management and development of the natural, physical and ecological resources and the historical and cultural heritage of SVG.

This Legislation established the National Parks, Rivers and Beaches Authority and granted this authority control of all rivers, streams, springs, swamps, waterfalls, water pools and beaches in the state and therefore is responsible for the overall management and maintenance of these sites.

At present, there are 35 protected areas within SVG. These include wildlife reserves, forest reserves and Marine Parks, Reserves and Conservation Areas.

No protected areas are situated in close proximity to the London project site and therefore will not be affected by project activities.

3.2.7 Forest Resource Conservation Act, 1992

The Forest Resource Conservation Act, 1992 repealed the Forest Act (No.25 of 1945). It makes provision for the conservation, management and proper use of the forests and watersheds, the declaration of forest reserves, cooperative forests and conservation areas, the prevention and control of forest fires. It established the Forestry Department for managing the nation's forests and watersheds and guiding the resource management and conservation process.

Under this legislation, there are penalties for violations of conservation regulations. Designated forest reserves under the Forest Resource Conservation Act, 1992 include the Cumberland, Kings Hill and Tobago Cays Forest Reserves. Other designated Forest Reserves in St. Vincent include the Soufriere, Mesopotamia, Colonarie, Richmond, Mt. Pleasant and Dalaway reserves. Proposed Forest Reserves include the La Soufriere National Park, Kingstown, Campden Park, Colanarie and Mt. Pleasant Forest Reserves.

It should be noted that the London project site is situated along the northern segment of the Windward Highway and therefore is not within or in close proximity to any designated or proposed forest reserve.

3.2.8 Fisheries Act, 1986

The Fisheries Act, 1996 was promulgated for the promotion and management of fisheries in SVG. This Act, allows the Minister to declare any area of fishery waters and any adjacent or surrounding land to be a marine reserve to protect flora and fauna, preserve natural breeding grounds and habitats of aquatic life (with particular regard to flora and fauna in danger of extinction), promote scientific study and research and preserve and enhance natural beauty.

Any person who fishes or attempts to fish, takes or destroys any flora or fauna other than fish, dredges or extracts sand or gravel, discharges or deposits waste or any other polluting matter, or in any way alters the natural environment; or constructs any structure on or over any land or waters within a reserve without permission from the Minister or any person authorized by him is guilty of an offence and liable to a fine.

Designated marine parks, reserves and conservation areas in SVG include, Bequia, Canouan, Isle de Quatre, Mustique and Union Island/Palm Island Marine Conservation Areas, Tobago Cays Marine Park and Petit St. Vincent Wildlife Reserve. Proposed Marine Parks include Chateaubelair Islet and the South Coast Marine Conservation Area.

None of these parks are situated within or in close proximity to the London project site and therefore will not be affected by project activities.

3.2.9 Central Water and Sewerage Authority Act, 2007

The Central Water and Sewerage Authority Act was enacted to make better provision for the conservation, control, apportionment and use of the water resources of SVG. This Act established the Central Water and Sewerage Authority. Key functions of the Authority include:

- Investigating the water resources of the country; and making recommendations to the Minister relating to the improvement, preservation, conservation, utilization and apportionment of those resources; and

- Examining surface and underground waters to determine whether pollution exists and the causes thereof.

Under Section 13, there is no right to use water, construct or operate any works in or adjacent to any water or bore and cause, or permit waste to come into contact directly or indirectly with any water otherwise than by virtue of this Act. In addition, under Section 14, no person shall use water in contravention of the provisions on this Act unless they are using water for or in connection with the construction of a public road.

Notwithstanding, the Contractor will have to make provisions to avoid/prevent the discharge of waste into the Agrika River in keeping with the Central Water and Sewerage Authority Act, 2007.

3.2.10 National Trust Act, 1969

This Act established the St. Vincent National Trust corporate entity whose mandate is to locate, restore and conserve areas of beauty as well as buildings and objects of archeological, architectural, artistic, historic, scientific, or cultural interest. In addition, the National Trust is responsible for conservation of flora and fauna in areas of natural beauty; and public education related to natural and historical assets.

Heritage sites in SVG include Fort Duvernette, Layou Petroglyph Park, Fort Charlotte, Curator's House at the Botanic Gardens and Escape Heritage Park. None of these sites are situated within or in close proximity to the project site and therefore will not be affected by project activities at London.

3.2.11 Noise Control Act, 2019

The Noise Control Act, 2019 manages noise pollution by providing a national code of practice for noise control which the Police enforce. This Act governs both pre- and during-construction and operational activity noise levels.

3.3 Regional and International Guidelines

3.3.1 The World Bank Environmental and Social Framework

This Framework establishes ten Environmental and Social Standards relating to the identification and assessment of environmental and social risks and impacts associated with projects financed by the Bank. These standards have been set to support borrowing nations in achieving good international practice relating to environmental and social sustainability; assist in fulfilling their national and international environmental and social obligations, enhance non-discrimination, transparency, participation, accountability and governance and enhance the sustainable development outcomes of projects through ongoing stakeholder engagement.

The ten environmental standards that will guide this project are described in Table 3-1 below:

TABLE 3-1: ENVIRONMENTAL AND SOCIAL STANDARDS

ENVIRONMENTAL AND SOCIAL STANDARD	DESCRIPTION
ESS1 - Assessment and Management of Environmental and Social Risks and Impacts	Sets out responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with each stage of a project.
ESS2 - Labour and Working Conditions	Promotes the fair treatment, non-discrimination and equal opportunity workers and protects vulnerable workers such as women, persons with disabilities, children of working age, migrant workers, contracted workers, community workers and primary supply workers, as appropriate. In addition, it provides workers with accessible means to raise workplace concerns.
ESS3 - Resource Efficiency and Pollution Prevention and Management	Sets out the requirements to address resource efficiency and pollution prevention and management throughout the project life cycle.
ESS4 - Community Health and Safety	Addresses the health, safety, and security risks and impacts on project-affected communities with particular attention to vulnerable persons.

ENVIRONMENTAL AND SOCIAL STANDARD	DESCRIPTION
ESS5 - Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Addresses involuntary resettlement or, by exploring project design alternatives, avoids forced eviction and mitigates unavoidable adverse social and economic impacts from land acquisition or restrictions on land use through the provision of timely compensation for loss of assets.
ESS6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources	Recognizes the importance of maintaining core ecological functions of habitats, including forests, and the biodiversity they support. It promotes the sustainable management of living natural resources and supports livelihoods of local communities through the adoption of practices that integrate conservation needs and development priorities.
ESS7 - Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Ensures that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples/ Sub-Saharan African Historically Underserved Traditional Local Communities.
ESS8 - Cultural Heritage	Sets out general provisions on risks and impacts on cultural heritage from project activities. It promotes meaningful consultation with stakeholders and equitable sharing of benefits from the use of cultural heritage.
ESS9 - Financial Intermediaries	Recognizes that strong domestic capital and financial markets and access to finance are important for economic development, growth and poverty reduction.
ESS10 - Stakeholder Engagement and Information Disclosure	Emphasizes the importance of open and transparent engagement between the client and stakeholders. It provides means for effective and inclusive engagement with project-affected parties throughout the project life cycle on issues that could potentially affect them and ensures that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible and appropriate manner and format.

3.3.2 Volcanic Eruption Emergency Project (VEEP), Environmental and Social Management Framework (ESMF), June 2023.

This ESMF has been prepared by the Government of St. Vincent and the Grenadines to ensure that the recovery efforts are carried out in an environment-friendly and socially sound manner and in accordance with the national and international standards. It will be used as a practical tool during program formulation, design, implementation, and monitoring of the VEEP, including the bridge construction at London. This document will be used as a guide during project implementation for ensuring environmental and social integration by the implementing agencies and contractors in planning, implementing, and monitoring of project-supported activities. It provides a set of steps, processes, procedure, and mechanism for ensuring an adequate level of environmental and social consideration and integration in each investment in the project-cycle; and describes the principles, objectives and approach to be followed to avoid or minimize or mitigate impacts. The specific objectives of this ESMF are to:

- Integrate the environmental and social concerns into the identification, design and implementation of all project interventions in order to ensure that those are environmentally sustainable and socially feasible.

- Detail institutional roles and responsibilities, monitoring and reporting requirements, an estimated Environmental and Social (E&S budget), and capacity-building measures.

- Ensure all relevant environmental and social issues are mainstreamed into the design and implementation of the projects/sub-projects and in the subsequent phases of the VEEP.

- Consider in an integrated manner the potential environmental and social risks, benefits and impacts of the program and identify measures to avoid, minimize and manage risks and impacts while enhancing benefits.

- Ensure compliance with national and World Bank requirements. The ESMF presents potential impacts of the VEEP, mitigation, enhancement, contingency and compensation measures, environmental and social management and monitoring plan, and institutional framework, including inter-agency cooperation for implementing ESMPs. The ESMF will facilitate the compliance of the Government of SVG's policies, acts and rules along with the World Bank's Environmental and Social Standards (ESSs) of the newly adopted Environmental and Social Framework (ESF).

- Guide conducting the detailed ESA/IEE/ESIAs of the later stages of the VEEP as appropriate to the project components/sub-components.

- Provide E&S Screening Checklist for risk classification of site-specific activities.

- Explain the procedures for safe storage, transportation, commercial use (if any) and disposal of ash, including assessment of existing disposal sites.

3.3.3 St. George's Declaration of Principles for Environmental Sustainability in the Organization of Eastern Caribbean States (OECS)

This Declaration sets out the broad framework to be pursued for environmental management in the OECS region. It consists of 21 Principles aimed to foster equitable and sustainable improvement in the quality of life within the member states of the OECS.

To meet the commitments under the Declaration, member states (including St. Vincent and the Grenadines) have agreed to implement shared goals for environmental management, specifically:

- To build the capacity of Member States and regional institutions to guide and support processes of sustainable development;

- To incorporate the objectives, perspectives, resources, knowledge and talents of all of society in environmental management;

- To achieve the long-term protection and sustained productivity of the region's natural resource base and of the ecosystem services it provides;

- To ensure that natural resources contribute optimally and equitably to economic, social and cultural development.

Desired outcomes of the first goal include national development polices, plans and programmes aimed at poverty alleviation, the general improvement of social, economic and cultural conditions, the conservation of biological diversity, disaster risk reduction, the mitigation of adverse effects of climate change and the maintenance of essential ecological processes and life support systems.

The proposed works at London are intended to improve social and economic conditions in St. Vincent and therefore is in accordance with the aims of the St. George's Declaration.

3.3.4 World Bank Group Environmental Health and Safety Guidelines

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice. The EHS Guidelines contain the performance levels and measures that are normally acceptable to the World Bank Group, and considered to be achievable in new facilities at reasonable costs by existing technology.

The World Bank Group requires borrowers to apply the relevant levels or measures of the EHS Guidelines. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects will be required to achieve whichever is more stringent.

On this project, due to the absence of national standards for ambient air quality and noise, guideline values listed in the EHS Guidelines will be used to place baseline air quality and noise data into context. There are no World Bank guidelines nor local standards for nearshore marine water quality for the parameters monitored. As such, regional guideline limits will be applied for context.

3.3.5 Sustainable Development Goals

The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by the United Nations in 2015, as a universal call to action to produce a set of goals that meet the urgent environmental, political and economic challenges facing the world today. There are 17 Sustainable Development Goals. Goal 9: Industry, Innovation and Infrastructure is applicable to this project.

The construction of the new bridge at London aligns with the target of Goal 9, which is to develop quality, reliable, sustainable and resilient infrastructure, including regional infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all.

3.4 International Treaties, Conventions and Agreements

Important regional agreements and other international agreements that are relevant to this project are summarized in Table 3-2.

TABLE 3-2: APPLICABLE INTERNATIONAL TREATIES AND ACCORDS TO WHICH ST. VINCENT AND THE GRENADINES IS A SIGNATORY

TREATY	SIGNED (S) RATIFIED (R) ACCEDED (A)		FOCAL POINTS NATIONAL (N) TECHNICAL (T)	
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	A	1988	N	Ministry of Agriculture, Forestry and Fisheries, Rural Transformation
Kyoto Protocol	S	1998	N	Ministry of Tourism, Civil Aviation, Sustainable Development and Culture
	R	2004		
Montreal Protocol	A	1996	N	Ministry of Tourism, Civil Aviation, Sustainable Development and Culture
The Paris Agreement	R	2016	N	Ministry of Tourism, Civil Aviation, Sustainable Development and Culture
United Nations Framework Convention on Climate Change (UNFCCC)	S	1996	N	Ministry of Tourism, Civil Aviation, Sustainable Development and Culture
Convention on Biological Diversity (CBD)	A	1996	N	Ministry of Tourism, Civil Aviation, Sustainable Development and Culture
Specially Protected Areas and Wildlife (SPAW)	S	1997	N	Ministry of Tourism, Civil Aviation, Sustainable Development and Culture

4 DESCRIPTION OF THE EXISTING ENVIRONMENT

This chapter provides a brief description of the area of interest and presents baseline information on various components of the natural environment (physical and biological) which may be affected by the proposed construction of the new bridge at London.

4.1 Area of Interest

The proposed project site exists along the Windward Highway within the parish of Charlotte at Sandy Bay (London) on the northern windward/eastern side of St. Vincent. The bridge provides crossing over the Agrika River and provides connectivity to and from the villages to the north: Owia and Fancy (see Figure 4-1).

According to the VEEP ESMF, for socially significant infrastructure such as hospitals, schools, residential buildings, cultural heritage sites, etc. the AOI for bridge subprojects will take into account the following (see Table 4-1 and Figure 4-1):

TABLE 4-1: AREA OF INTEREST

Noise	500 metres radius around the construction site
Roads/Bridges	50 metres from Right-of-Way (ROW) on both sides
Linear Structures	50 metres from ROW on both sides
Air pollution (dust/vehicular emissions)	Sensitive receptors within 500 metres of the worksite in a downwind direction.

FIGURE 4-1: AREA OF INTEREST

4.2 Physical Environment

This section discusses the components of the physical environment under the following subsections:

- Climate;
- Topography and Drainage;
- Geology;
- Seismicity;
- Hydrogeology;
- Soil Types;
- Ambient Water Quality;
- Ambient Air Quality;
- Noise; and
- Natural Hazards.

4.2.1 Climate

The following meteorological parameters were examined to establish the baseline climatology for the study area/St Vincent.

- Rainfall;
- Temperature;
- Relative Humidity; and
- Wind Regimes.

4.2.1.1 Rainfall

According to Saint Vincent's Environmental Profile (1991), annual rainfall in St. Vincent varies from approximately 1700 mm (67 inches) in dry coastal locations to 7000 mm (276 inches) in the wet central mountains. There are two distinct seasons: the wet season which generally occurs from June to December, and the dry season which generally occurs from January to May. However, it must be noted that the length of each season varies greatly depending on location.

The mountainous terrain of the island creates a range of microclimates, which vary with height, location and orientation. The central mountains cause moisture laden air to rise which when it cools, expands and results in orographic cloud formation and rainfall.

Rainfall data recorded at the Rabacca Climo climate station located to the south of the London Project site (see Figure 4-2) for the period March 2009 to May 2023 was obtained from the Central Water and Sewerage Authority for use on this project (see Table 4-2). The total average rainfall for the period March 2009 to December 2023 was 1646.1 mm. During this period, November recorded the highest average rainfall (242.7 mm), whereas February recorded the lowest average rainfall (63.4 mm) (see Table 4-2).

4.2.1.2 Temperature

St. Vincent has an average monthly temperature of 27 °C with little diurnal or locational variation due to the dampening effect of the surrounding ocean. Temperature peaks in the rainy season, reaching a maximum of up to 31°C and drops as low as 23 °C in the dry season (National Adaptation Plan for St. Vincent and the Grenadines 2019).

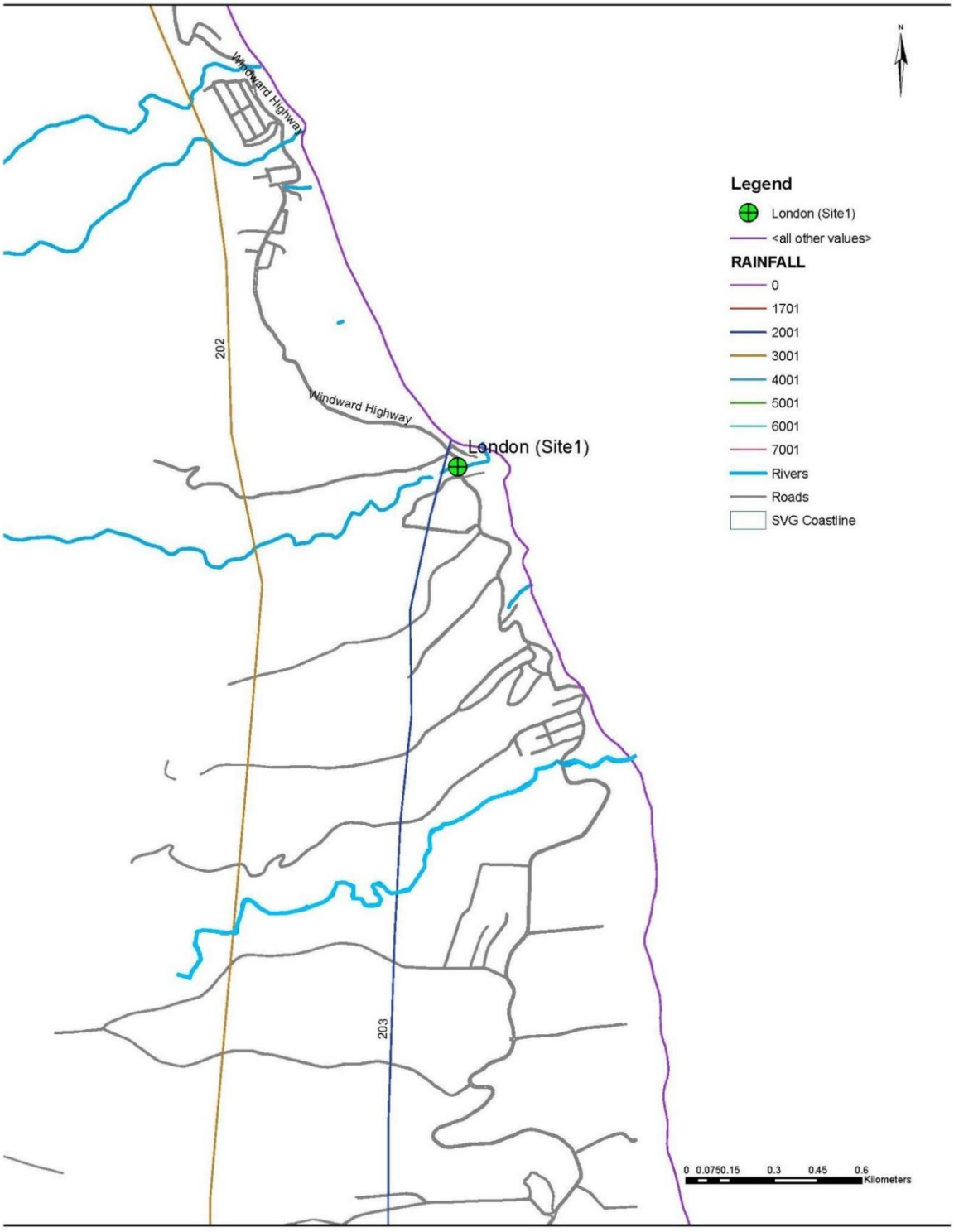
4.2.1.3 Relative Humidity

Relative Humidity (RH) indicates the amount of water vapour in the air expressed as a percentage. RH is affected by many factors, such as proximity to a water body, as well as the atmospheric environment; such as temperature and wind speed. RH is usually defined for a single location at a single point in time. It should be noted that localized effects do play a role in differences in the RH experienced at any given location.

In St. Vincent, RH is high throughout the year; above 70%. However, RH is higher during the rainy season than the dry season (National Adaptation Plan for St. Vincent and the Grenadines 2019).

4.2.1.4 Wind Regimes

The North-East Trade winds blow steadily across the island at approximately 15 to 25 knots most of the year. The period June to December is characterized by stronger, irregular winds associated with the passage of tropical storms and hurricanes.



Source: GIS Unit, Physical Planning Unit, Ministry of Transport, Works, Lands and Surveys, and Physical Planning Accessed for Project in 2023.

FIGURE 4-2: ISOHYETAL MAP

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TABLE 4-2: MONTHLY AVERAGE RAINFALL RECORDED AT RABACCA CLIMO CLIMATE STATION (MARCH 2009 TO DECEMBER 2023)

YEAR	MONTH												TOTAL (MM)
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	
2009			6.8	194.1	207.7	147.8	173.2	154.4	94.3	54.4	129.2	0.2	1162.1
2010	0.0	3.9	44.5	126.4	118.5	199.8	203.4	142.0	162.6	44.9	83.2	231.3	1360.5
2011	90.5	35.7	153.2	247.0	179.6	187.9	218.7	263.4	132.3	147.2	234.1	127.9	2017.5
2012	25.7	126.4	99.1	222.7	397.8	38.4	175.0	181.5	89.9	249.5	158.1	139.3	1903.4
2013	77.5	31.8	52.7	368.5	160.9	118.7	67.3	161.4	193.6	281.0	145.8	435.1	2094.3
2014	82.8	70.7	91.0	34.3	49.3	86.4	67.0	173.0	171.1	104.8	357.3	89.5	1377.2
2015	142.4	46.2	144.0	118.9	15.9	81.7	107.8	121.3	237.8	180.7	183.2	96.2	1476.1
2016	114.0	115.1	68.6	60.0	142.5	165.6	193.4	62.7	430.6	209.6	738.4	117.5	2418.0
2017	142.2	26.5	80.2	92.9	62.4	191.9	142.6	215.3	274.1	175.5	227.0	175.5	1806.1
2018	89.7	62.2	102.0	61.9	46.5	86.1	91.3	117.9	152.0	320.8	166.8	73.4	1370.6
2019	45.5	19.4	108.1	84.5	152.0	114.5	150.1	100.5	157.4	141.4	142.5	88.8	1304.7
2020	148.9	28.8	27.9	29.6	19.2	174.3	155.5	191.2	150.1	506.3	352.1	66.7	1850.6
2021	131.1	33.2	70.6	41.9	33.5	195.4	127.6	336.1	118.8	119.1	135.6	51.4	1394.3
2022	165.0	159.8	41.2	180.2	63.6	159.8	131.2	470.2	598.2	260.4	344.6	124.1	2698.3
2023	64.5	127.2	22.6	110.6	133.3								458.2
Average	94.3	**63.4**	74.2	131.6	118.8	139.2	143.1	192.2	211.6	199.7	**242.7**	129.8	**1646.1**

No Data Available

Source: Central Water and Sewerage Authority, 2023

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Source: Google Earth, 2023

FIGURE 4-3: LOCATION OF RABACCA CLIMATE STATION IN RELATION TO PROJECT SITE

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4.2.2 Topography and Drainage

St. Vincent is roughly oval in shape with a central spine of mountains running from north to south with steep ridges radiating towards the east and west. The highest mountains (The Soufriere Mountains) are located to the north of the island (NBSAP, 2000). According to St Vincent's Environmental Profile (1991), the interior of the island is very rugged, 50% of the island's total surface has slopes of 30 degrees or more and only 20 % has slopes of 20 degrees or less. The proposed project site at London falls on the 50 ft contour (see Figure 4-4).

The Agrika River catchment covers an acreage of 272 hectares. The river is characterized by a rocky substrate with large pyroclastic boulders formed and deposited as a result of volcanic eruptions. During the dry season, flow within the river is minimal, however, during heavy rainfall events in the wet season, large volumes of water and lahar torrent through the channel towards the outfall (see Photograph 4-1) on the east coast of the island into the Atlantic Ocean. It should be noted that the outfall of the Agrika River is approximately 120 m east of the proposed project site.

PHOTOGRAPH 4-1: AGRIKA RIVER OUTFALL

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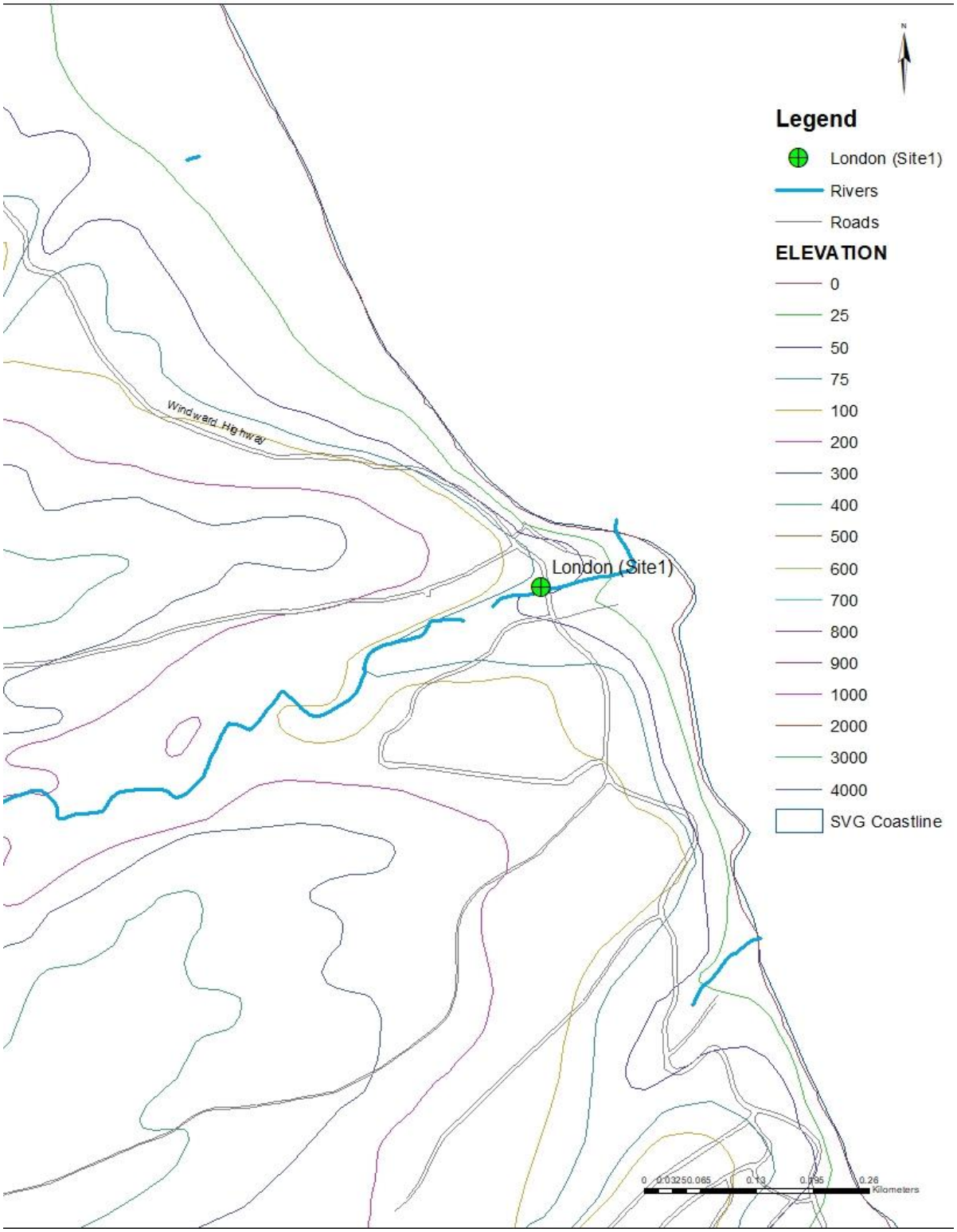

Source: GIS Unit, Physical Planning Unit, Ministry of Transport, Works, Lands and Surveys, and Physical Planning Accessed for Project in 2023

FIGURE 4-4: TOPOGRAPHY AND DRAINAGE MAP

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4.2.3 Geology

The island of St Vincent is divided into four main geologic regions (see Figure 4-5):

- The South-East Volcanics;
- The Grand Bonhomme Volcanic Centre;
- Morne Garu Volcanic Centre; and
- Soufriere Volcanic Centre.

The proposed project site falls within the Soufriere Volcanic Centre which occupies the northern third of the island (see Figure 4-5). It is the youngest and only centre considered to be active on the island. There are four principal rock formations within the crater. The Debris Flow formation is the lowest exposed formation and is supported by deposits consisting of angular basaltic blocks. Overlying this is the Brown Tuff which is a well-bedded succession of ash deposits and minor surge layers which contain angular basaltic lithic fragments. Above this are thick basaltic andesite lava flows, referred to as Crater Lavas. The topmost deposit exposed in the crater consists of a thick sequence of pyroclastic flow and airfall deposits, which are called the Pyroclastic Formation (UWI Seismic Research Centre).

As seen in Figure 4-6, the project site is mainly underlain by pyroclastic deposits of Soufriere volcanic centres.

4.2.4 Seismicity

The close proximity of St. Vincent to the Caribbean Plate Margin makes the island vulnerable to considerable seismic activity. According to St. Vincent's Environmental Profile (1991), there were no major faults or folds recorded previously which suggests that no major tectonic disturbances, other than the volcanic ones, have occurred on the island. In the northern section of the island where the project site is located, clusters of seismic events arise from background activity of the Soufriere Volcano. Seismic activity at the volcano is monitored by a network of sensors located in different towns on the island and at the summit of the volcano. These stations transmit measurements directly to the University of the West Indies Seismic Centre in Trinidad and Tobago, where it is processed.

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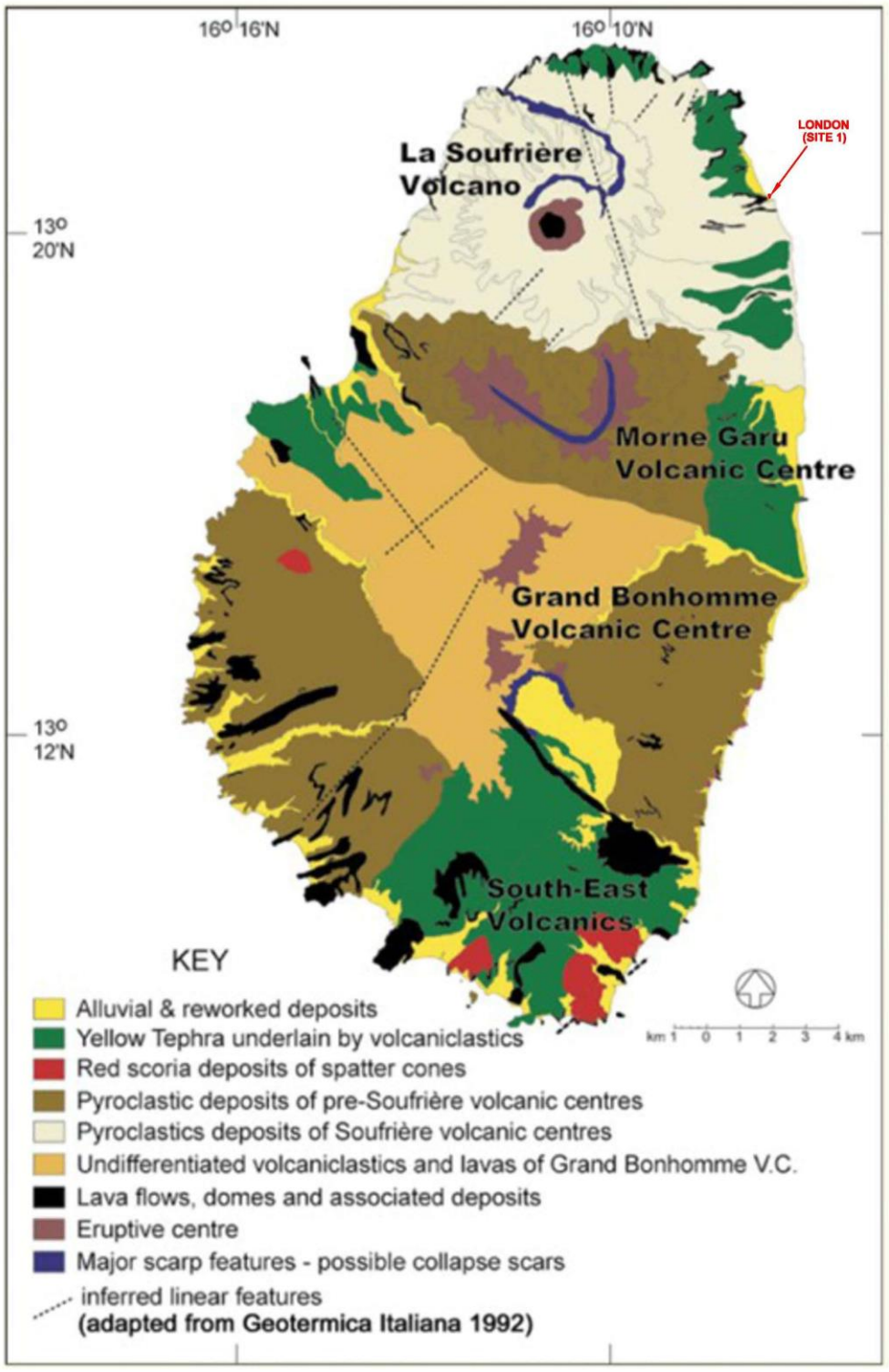

Source: UWI Seismic Research Centre Accessed 2023.

FIGURE 4-5: GEOLOGIC REGIONS OF ST. VINCENT

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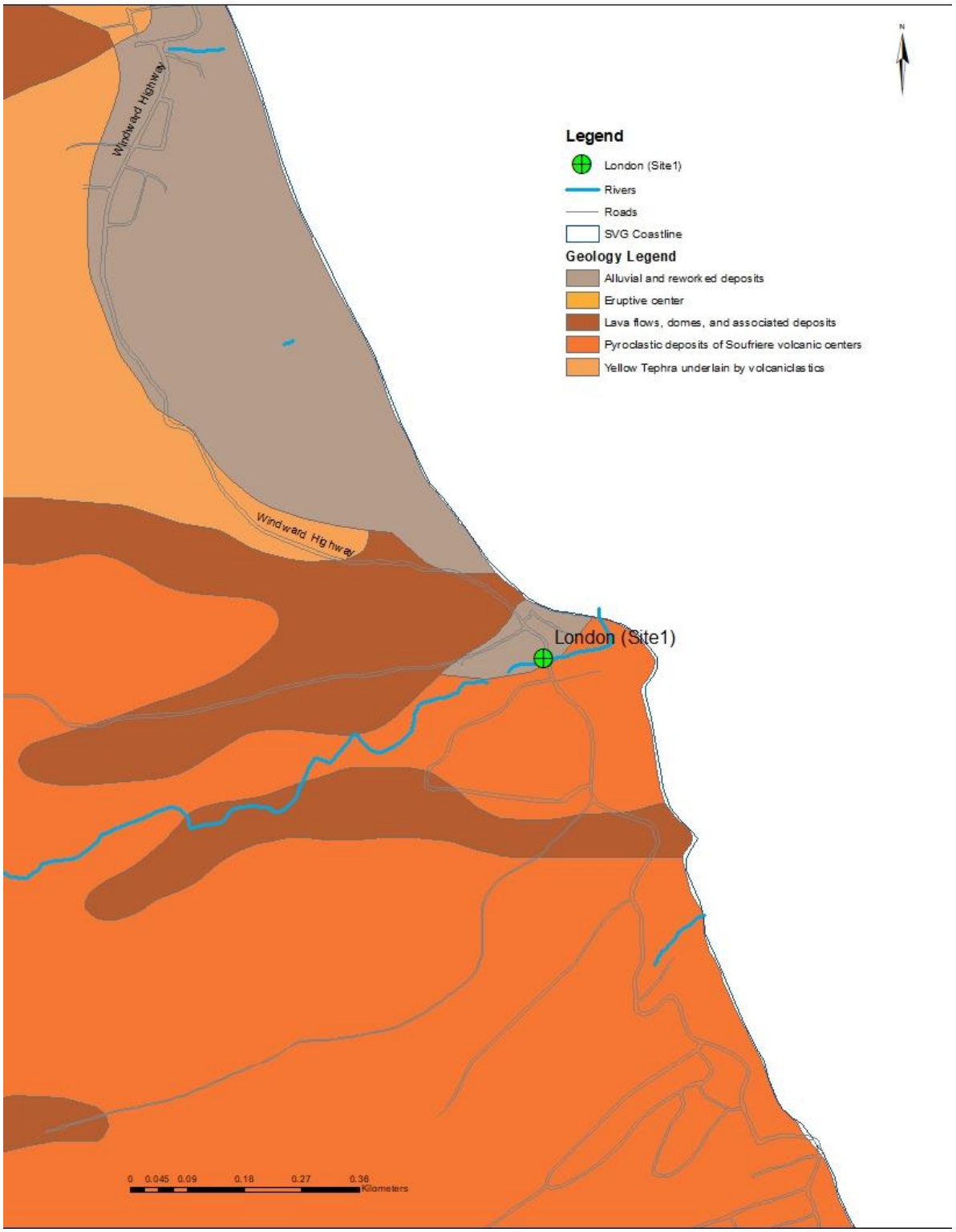

Source: GIS Unit, Physical Planning Unit, Ministry of Transport, Works, Lands and Surveys, and Physical Planning Accessed for Project in 2023

FIGURE 4-6: GEOLOGY OF THE STUDY AREA

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4.2.5 Hydrogeology

According to a Hydrogeological Map prepared as part of the National Water Resource Management Project, the project site is located within the island's main aquifer unit (see Figure 4-7). To date, there has been limited development of groundwater resources in St. Vincent for public supply. However, it should be noted that part of the proceeds of the Volcanic Eruption Emergency Project, have been allocated to consulting services for the development of a water supply system using a groundwater source at Overland to replace the existing systems at Sandy Bay and Owia (Volcanic Eruption Emergency Project, 2022).

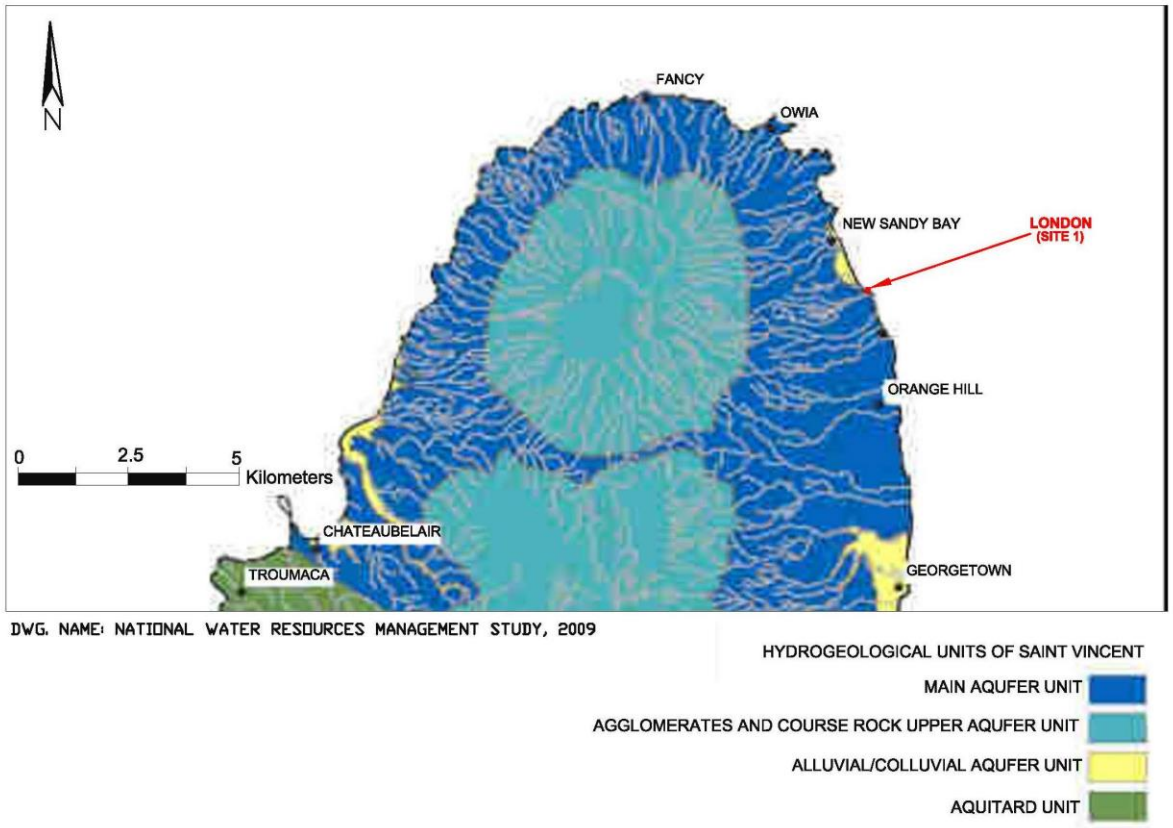


FIGURE 4-7: HYDROGEOLOGY OF THE STUDY AREA

4.2.6 Soil Types

Soil types at the London project site were described from published information and test pit investigations.

4.2.6.1 General Soil Types

Generally, the soils of St. Vincent are readily erodible since they tend to be unconsolidated and friable (Caribbean Conservation Association 1991). Three main soil types exist in St. Vincent. These include the following:

- Volcanic Ash Soils;
- Yellow Earth Soils;
- Alluvial soils of the Coastal Plains and Valleys.

The most dominant soil type is volcanic ash. As can be seen in Figure 4-8, the main soil type at the project site is recent volcanic ash. Volcanic ash soils are unconsolidated, immature, course, porous, fertile and highly susceptible to erosion (St. Vincent Environmental Profile 1991).

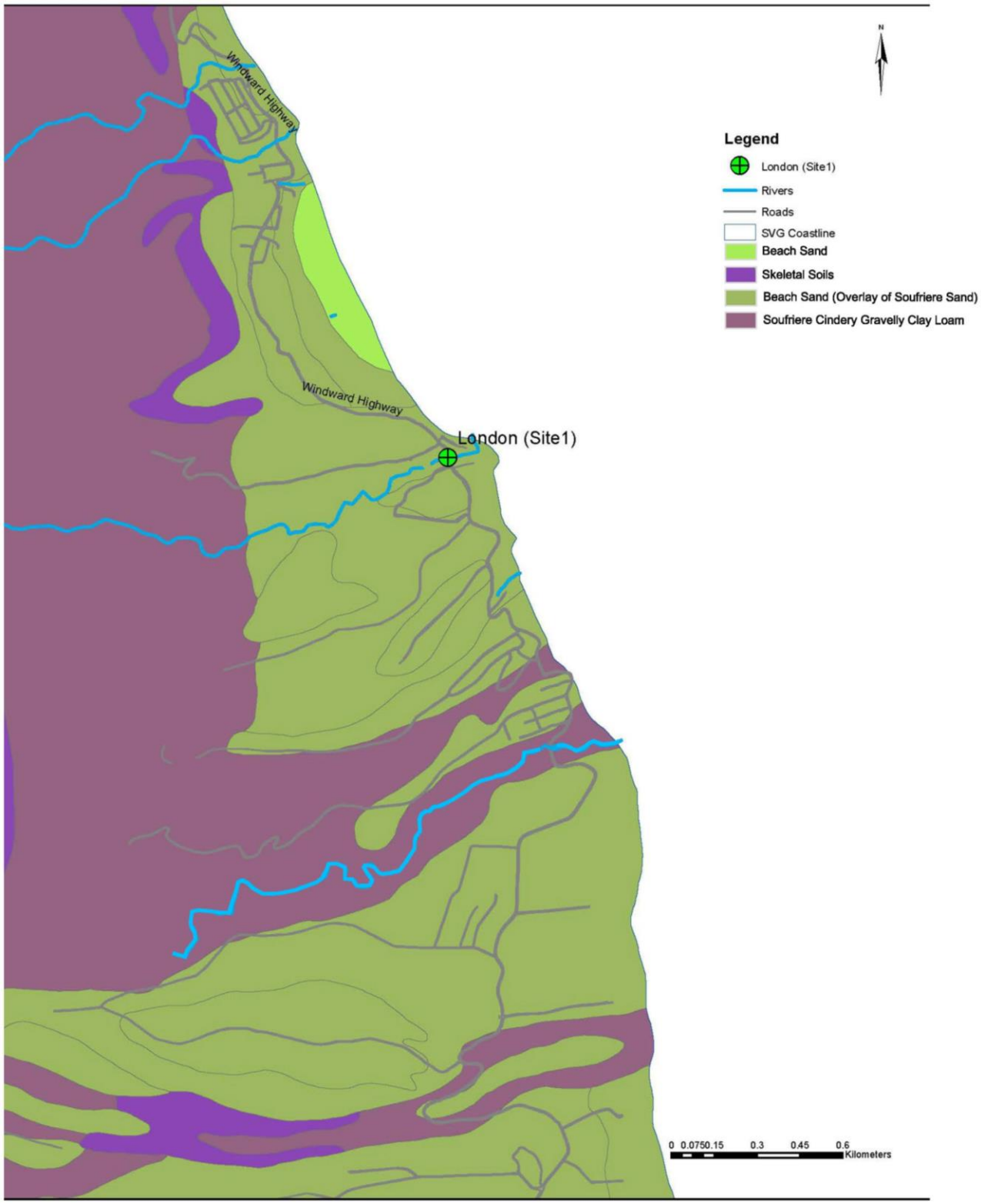
4.2.6.2 Test Pits

To assess the soil composition at the proposed project sites, test pits were excavated within the respective riverbeds and at the elevation of the roadway. The depths of these pits ranged between 1.5 m and 2.5 m. Soil stratigraphy within the test pits comprised mainly of sand and gravel. Two test pits were excavated at London by Trintoplan Consultants Limited. Information from the Trintoplan Geotechnical Report dated July 2023 is summarized below:

- One soil unit was encountered in both test pits. This soil unit consisted of grey and brownish grey sand with gravel and cobbles of various sizes.

- Natural moisture contents ranging from 9% to 12 % were recorded in this soil unit.

- The grain size distribution curve recorded a clay content of 0%, a silt content of 3%, sand contents ranging between 64 to 85% and gravel contents ranging between 12 to 33%.



Source: GIS Unit, Physical Planning Unit, Ministry of Transport, Works, Lands and Surveys, and Physical Planning Accessed for Project in 2023

FIGURE 4-8: SOIL TYPES AT THE PROJECT SITE

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4.2.7 Water Quality

Potential sources of contamination of the Agrika River from field observations and nearshore water quality monitoring were used to describe ambient water quality at the London project site.

4.2.7.1 Sources of Water Quality Impairment

During site reconnaissance, potential sources of contamination of the water quality of the Agrika River included spills and leaks of hydrocarbons from vehicles traversing the roadway (Windward Highway), run-off from roadside drains, discharge from nearby residential homes, littering/solid waste dumping and inflows of volcanic ash residue (from previous eruptions of the Soufriere Volcano) during heavy rainfall events.

During the dry season, flow within the river is minimal, however, during heavy rainfall events in the wet season, large volumes of water flow through the channel out to the sea on the eastern coast of the island into the Atlantic Ocean. Therefore, any contaminants released into the river are eventually transported into the nearshore marine environment due to the proximity of the site to the shoreline.

4.2.7.2 Nearshore Water Quality Monitoring

Nearshore marine water quality monitoring was conducted at the outfall of the Agrika River on July 05, 2023. Full details of the methodology of the water quality monitoring exercise are provided in Appendix A. The results of this monitoring exercise are presented in Table 4-3 below.

TABLE 4-3: RESULTS OF NEARSHORE WATER QUALITY MONITORING

MONITORING LOCATION	TEMPERATURE (°C)	pH	DO (MG/L)	TURBIDITY
Outfall of Agrika River (London)	29.1	8.11	6.40	14.7
Trinidad and Tobago Water Pollution Rules (WPR), 2019	≤ 32 °C	6.5 to 8.5	≥ 5 mg/L	Not Quoted

In the absence of national laws for water quality in St. Vincent, the Trinidad and Tobago Water Pollution Rules (WPR), 2019 was used for comparison purposes. Temperature, pH and Dissolved Oxygen concentration were in compliance with the respective ambient standards stipulated in the WPR 2019. None of the sources of water quality impairment identified (see Section 4.2.6.1, above) appear to affect the water quality within the nearshore marine area, however, at the time of monitoring, there was no flow in the Agrika River.

4.2.8 Air Quality

Potential sources of air emissions from field observations and air quality monitoring were used to describe ambient air quality at the London project site.

4.2.8.1 Sources of Air Emissions

The main sources of air emissions noted were exhaust emissions and kick up of dust/volcanic ash from vehicles traversing the Windward Highway.

4.2.8.2 Ambient Air Quality Monitoring

Ambient air quality monitoring was conducted on July 03, 2023, at an upwind location and a downwind location to the London site. At each monitoring location, two (2) portable MiniVol Tactical Air Samplers manufactured by Air Metrics were used to measure Particulate Matter ($PM_{2.5}$ and PM_{10}). Full details of the methodology of the air quality monitoring exercise are provided in Appendix B. Figures 4-9 and 4-10 present the estimated 24-hour concentrations of particulate matter at each monitoring location.

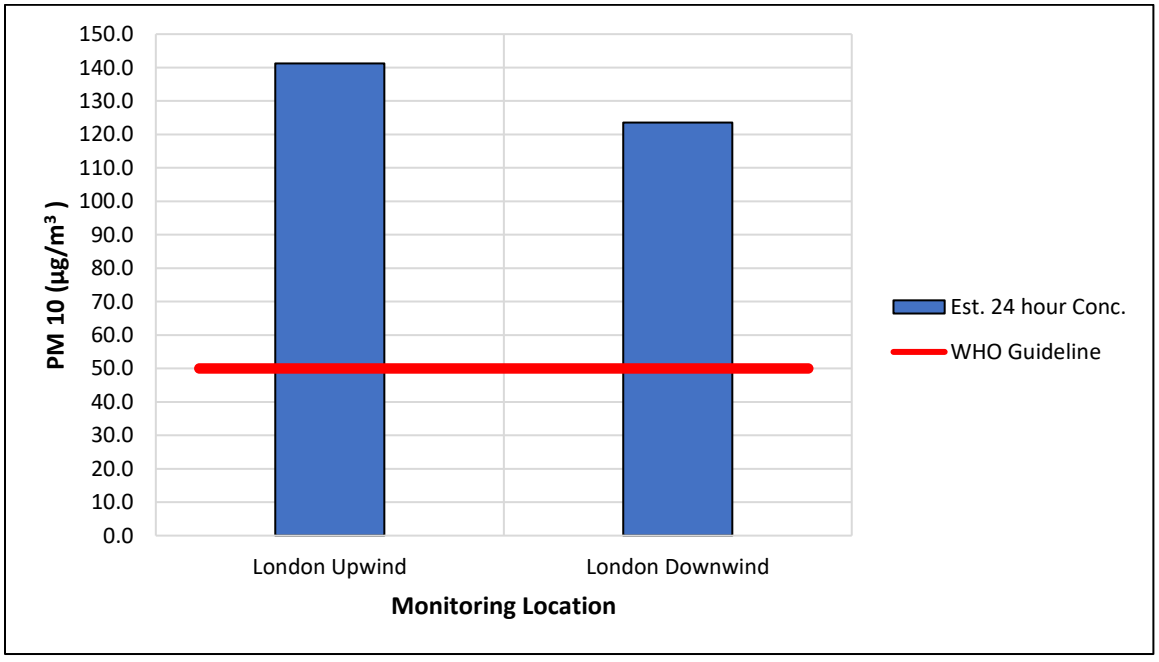

FIGURE 4-9: ESTIMATED 24 HOUR CONCENTRATIONS OF PM_{10}

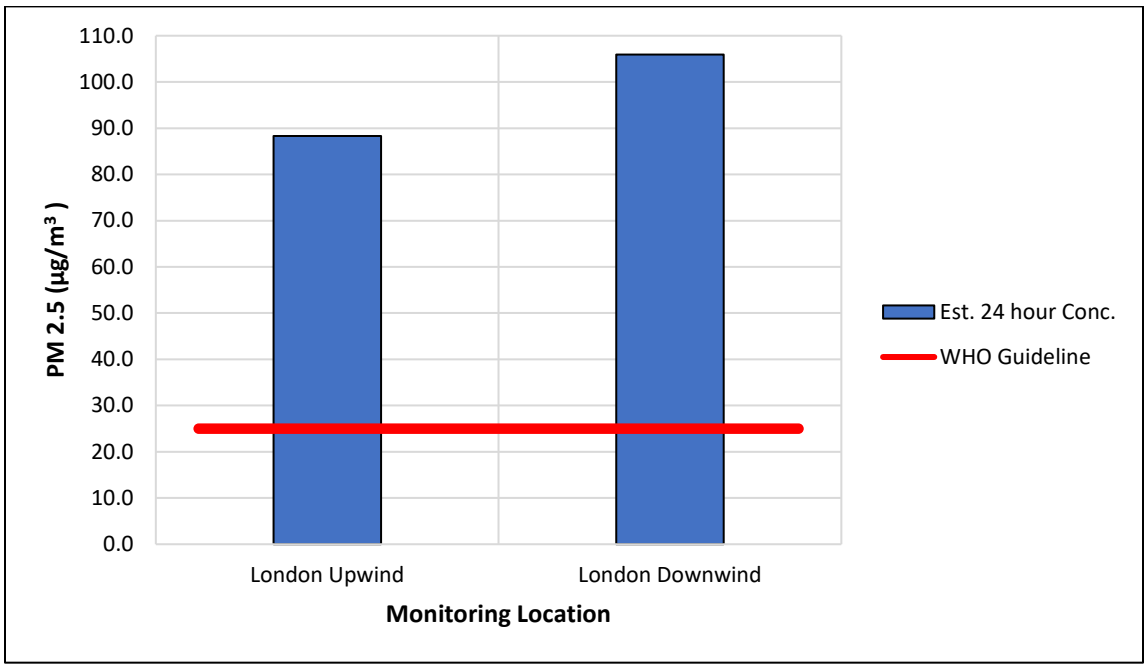

FIGURE 4-10: ESTIMATED 24 HOUR CONCENTRATIONS OF $PM_{2.5}$

The main findings of this air monitoring exercise were as follows:

- The main sources of air emissions at London were noted as exhaust emissions and kick up of dust/volcanic ash from vehicles traversing the Windward Highway.
- PM_{10} concentrations were higher upwind than downwind.
- Estimated 24-hour concentrations of PM_{10} exceeded the WHO Guideline of 50 µg/m^3 for a 24-hour averaging period at both monitoring locations.
- $PM_{2.5}$ concentrations were higher downwind than upwind.
- Estimated 24-hour concentrations of $PM_{2.5}$ exceeded the WHO Guideline of 25 µg/m^3 for a 24-hour averaging period at both monitoring locations.
- Overall, the results of this air quality monitoring exercise indicate that air quality at London is impaired as a result of dusty conditions.
- The sources of air emissions identified, together with windy conditions, appear to significantly impact the ambient concentrations of $PM_{2.5}$ and PM_{10} at the London project site.

4.2.9 Noise

The main receptors to noise at the London bridge site are residential dwellings along the northern and southern banks of the Agrika River. Other sensitive receptors include schools and churches within the Sandy Bay area. Potential sources of noise from field observations and noise monitoring were used to describe ambient noise at the London project site.

4.2.9.1 Sources of Noise

Table 4-4 below lists the sources of noise identified at the London bridge site.

TABLE 4-4: SOURCES OF NOISE AT THE PROJECT SITE

MONITORING LOCATION	SOURCES OF NOISE	
	DAYTIME	NIGHTTIME
London	• Roosters crowing • Birds chirping • Vehicles traversing roadway	• Wind; • Waves crashing along coastline; • Dogs Barking; • Insect Stridulation; • Vehicles traversing roadway.

4.2.9.2 Noise Monitoring

Equivalent continuous sound pressure levels (Leq) were monitored for one (1) hour during the daytime and one (1) hour during the nighttime at the nearest sensitive receptor to the project site. Full details of the methodology of the noise quality monitoring exercise are provided in Appendix C. The main findings of this noise monitoring exercise were as follows:

- Equivalent continuous sound pressure levels (Leq) were higher during the nighttime (63.3 dBA) than the daytime (58.5 dBA).

- The Daytime Leq values recorded at London was slightly above the 55 dBA daytime limit for residential areas stipulated by the World Bank Noise Guidelines.

- Similar to the daytime, nighttime the Leq value recorded at London exceeded the 45 dBA nighttime limit for residential areas by the World Bank Noise Guidelines.

4.2.10 Natural Hazards

The islands of the Eastern Caribbean are particularly vulnerable to natural hazards. St. Vincent has suffered from a number of natural hazards in the past and have faced many negative effects. Information on natural hazards to which St. Vincent and the Grenadines is vulnerable is presented under the following headings:

- Volcanic Eruptions;
- Earthquakes and Tsunamis;
- Hurricanes and Other Storms; and
- Landslips and Rockslides.

4.2.10.1 Volcanic Eruptions

The Soufriere Volcano, located in the north of St. Vincent is the youngest volcanic centre on the island (see Figure 4-11). It stands at an elevation of 1,178 m above sea level and the main crater of the Soufrière is about 1.6 km in diameter and 300-600 m in depth. La Soufriere has erupted explosively many times in the history of the island. After 40 years of low activity, the most recent eruption occurred in 2021. There was an effusive eruption which began in December 2020 and lasted 3 months until the explosive eruption occurred on April 9th, 2021. Approximately 22,000 persons had to be evacuated and 88 shelters were activated in the northern portion of the island. The most impacted community after this eruption was Sandy Bay, located north-east of the island. Subsequent to the eruption, heavy rainfall resulted in lahars, or mudflows composed of pyroclastic materials, rocky debris and water, which flow from the upper flanks of the volcano along rivers. It should be noted that communities in the Sandy Bay area near the Karo, Cayo, Noel and the Agrika River at the London site were deemed the most vulnerable to flash flooding and potential impacts from mudflows by the Lahar Mapping and Demarcation Zone Committee (Lahar Mapping and Demarcation Zones, 2021). Clean up operations costed over EC$28 million dollars (UWI Seismic Centre).

In addition, a submarine volcano, called “Kick ‘em Jenny”, located 160 m below sea level, approximately 7 km north of Grenada (see Figure 4-12), is one of the most active volcanoes in the Lesser Antilles. The most recent eruption of this volcano occurred in April 2017, with an instrumentally recorded unrest period in 2018. This volcano, although it is not located on the island of St. Vincent, is important to note as it has the potential to generate seismic sea waves, or tsunamis which can be detrimental to nearby islands, such as St. Vincent.

4.2.10.2 Earthquakes and Tsunamis

As stated in Section 4.2.4, the close proximity of St. Vincent to the Caribbean Plate Margin makes the island vulnerable to considerable seismic activity. In addition, earthquakes are also produced on the island as a result of volcanic activity of the Soufriere Volcano.

Seismic activity caused by plate movements, faulting and volcanic eruptions has the potential to generate seismic sea waves, or tsunamis, which can be destructive to coastal areas within the region. Given the proximity of the Kick 'em Jenny underwater volcano (see Figure 4-12), tsunamis pose a particular threat to the Grenadines and the southern coast of St. Vincent.

4.2.10.1 Hurricanes and Other Storms

Tropical storms and hurricanes are prevalent in the Eastern Caribbean during the June to October hurricane season. Tropical storms are classified as cyclones when their maximum wind speeds are between 34 knots (63 km/h) and 63.7 knots (118 km/h). Hurricanes have maximum wind speeds in excess of 63.7 knots (118 km/h). For this project, historical tropical storms and hurricanes from 1950 to 2023 that occurred within 60 miles of St. Vincent were considered applicable. These storms and/ or hurricanes can be considered as close passages. A total of 39 close passages occurred within the period 1950 to 2023, with 8 being unnamed (see Figure 4-13). The named close passages were:

- Bret (2023)
- Elsa (2021)
- Dorian (2019)
- Kirk (2018)
- Harvey (2017)
- Matthew (2016)
- Chantal (2013)
- Helene (2012)
- Ernesto (2012)
- Tomas (2010)
- Ernesto (2006)
- Gamma (2005)
- Bonnie (2004)
- Claudette (2003)
- Lili (2002)
- Jerry (2001)
- Iris (2001
- Chantal (2001)
- Debby (1994)
- Emily (1987)
- Danielle (1986)
- Allen (1980)
- Ana (1979)
- Gertrude (1974)
- Chloe (1971)
- Beulah (1967)
- Judith (1966)
- Edith (1963)
- Abby (1960)
- Janet (1955)
- Dog (1951)

Tropical Storm Elsa in 2021, which subsequently upgraded to a category 1 hurricane, produced substantial rainfall which resulted in major flooding and lahars causing significant damage to communities especially those located near to river outfalls.

FIGURE 4-11: LOCATION OF LA SOUFRIERE VOLCANO IN RELATION TO PROJECT SITE

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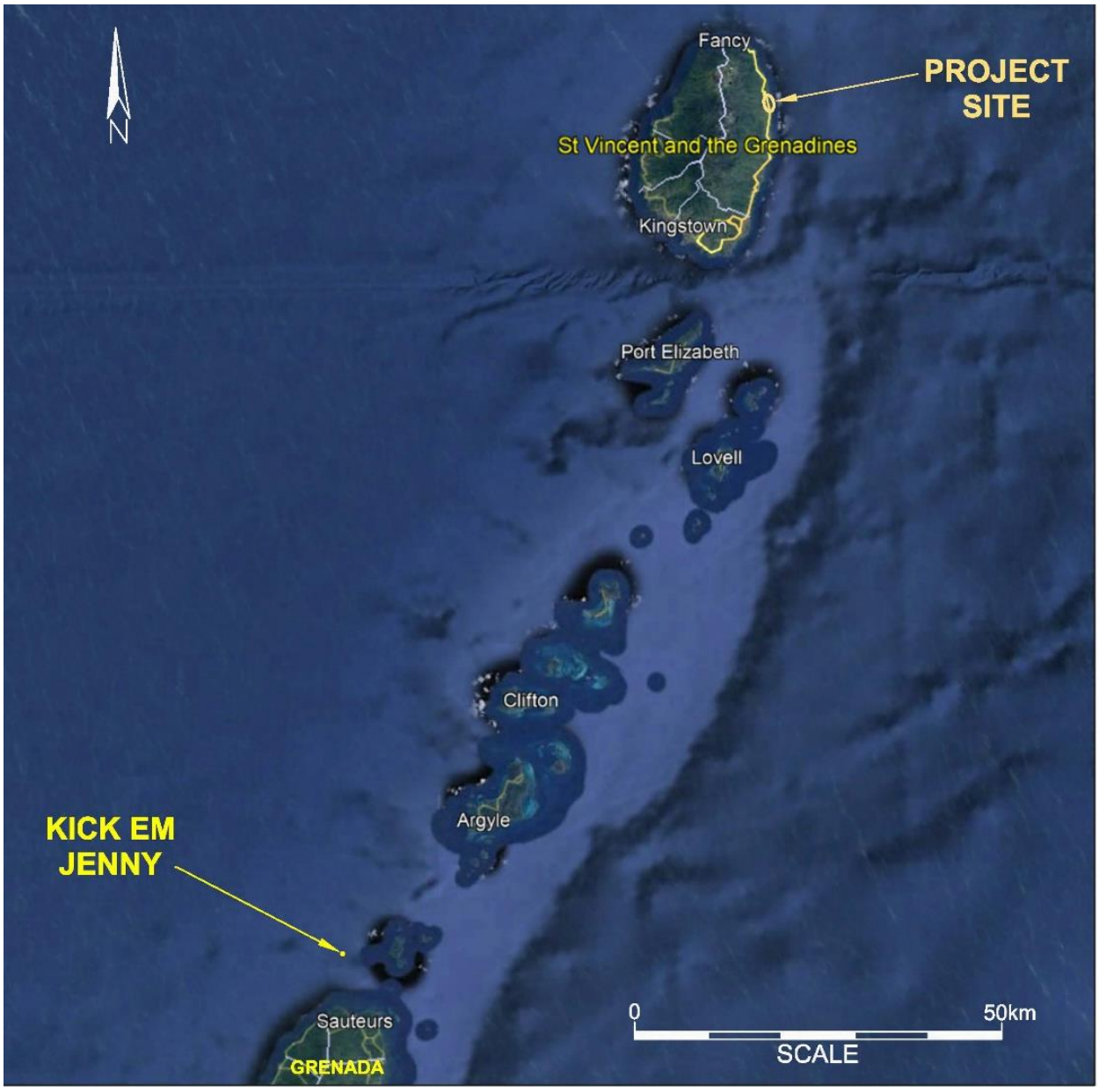

FIGURE 4-12: PROXIMITY OF KICK 'EM JENNY TO STUDY AREA

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4.2.10.2 Landslips and Rockslides

Landslides occur when the forces of gravity exceed the strength of the forces holding soil material together, resulting in a mass of soil being pulled downward. Water in soils contributes to increased landslide risk because the weight of the water is an added stress on the soil mass that is also being lubricated by the water molecules. As a result of the steep topography, common occurrence of unconsolidated pyroclastic rocks and heavy rainfall events, slope instability leading to landslides and slumping is a major problem in St. Vincent. Landslide events can cause damage to infrastructure and poses a threat to the lives and livelihoods of Vincentians.

'Lahar' describes flows that involve a mixture of loosely consolidated volcanic debris and water occurring on and around volcanoes. The material flows down from a volcano, typically along a river valley. Lahars can be extremely destructive: they can flow tens of metres per second, and large flows tend to destroy any structures in their path. Lahars typically follow explosive eruptions as a consequence of intense rainfall during rainy seasons. Lahars will continue to be a significant hazard on St Vincent as climate projections show the occurrence of more intense rainfall. As mentioned in Section 4.2.10.1, communities in the Sandy Bay area near the Karo, Cayo, Noel and the Agrika River at the London site are deemed the most vulnerable to flash flooding and potential impacts from mudflows.

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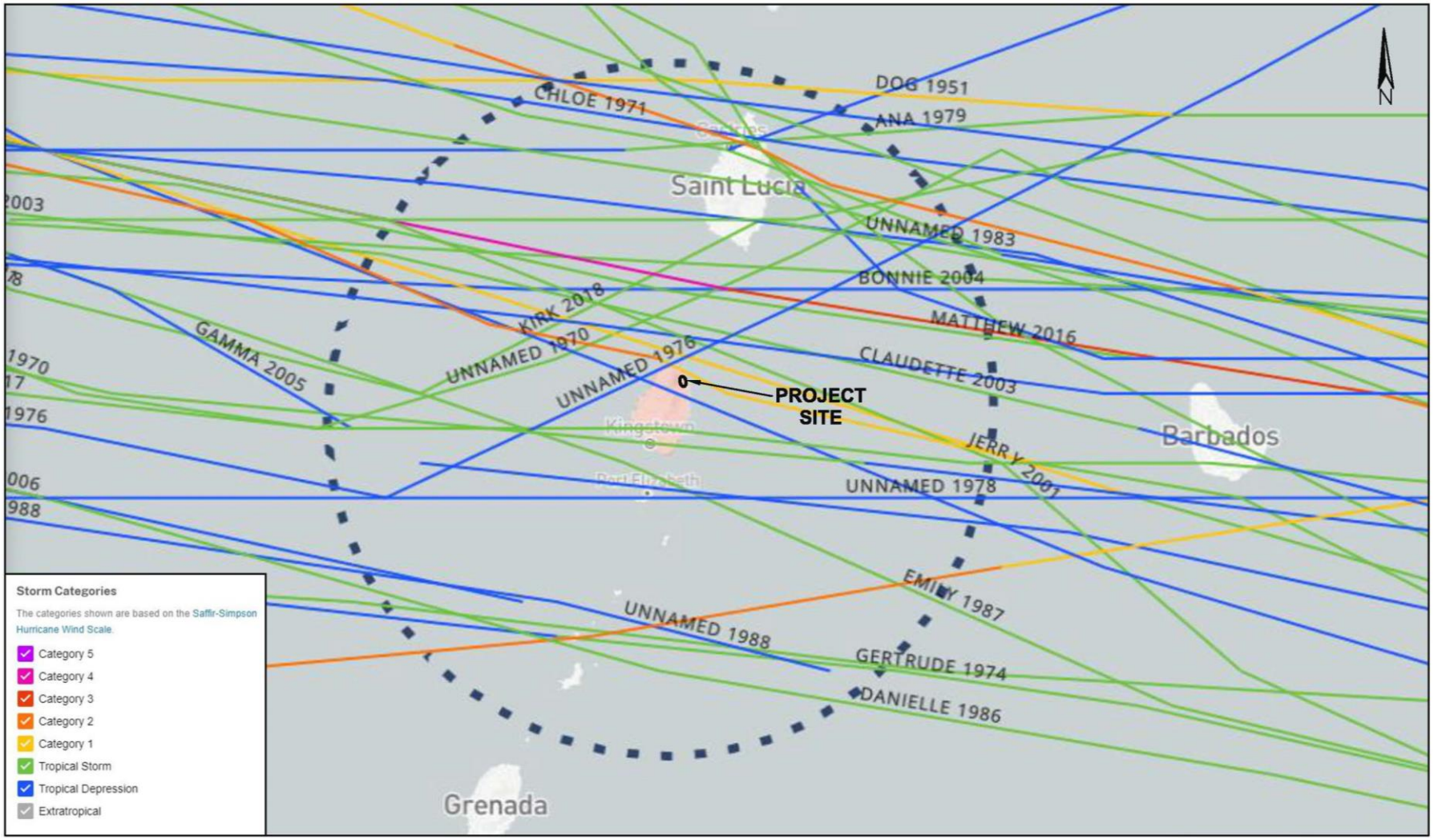

Source: National Oceanic and Atmospheric Administration, 2023

FIGURE 4-13: TROPICAL STORMS AND HURRICANES

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4.3 Biological Environment

For this ESIA, the area of interest for the biological environment was 500 metres around the project site at London. Information on the biological environment is presented under the following headings:

- Terrestrial Flora;
- Terrestrial Fauna;
- Marine Biodiversity;
- Endemic, Rare or Threatened Species;
- Protected Areas;
- Wildlife Reserves;
- Forest Reserves; and
- Marine Conservation Areas.

Information in this section is based on observations made during field reconnaissance conducted on July 03, 2023, as well as the review of available literature particularly the National Biodiversity Strategy & Action Plan for St. Vincent & the Grenadines, 2000 prepared by Simmons and Associates.

4.3.1 Terrestrial Flora

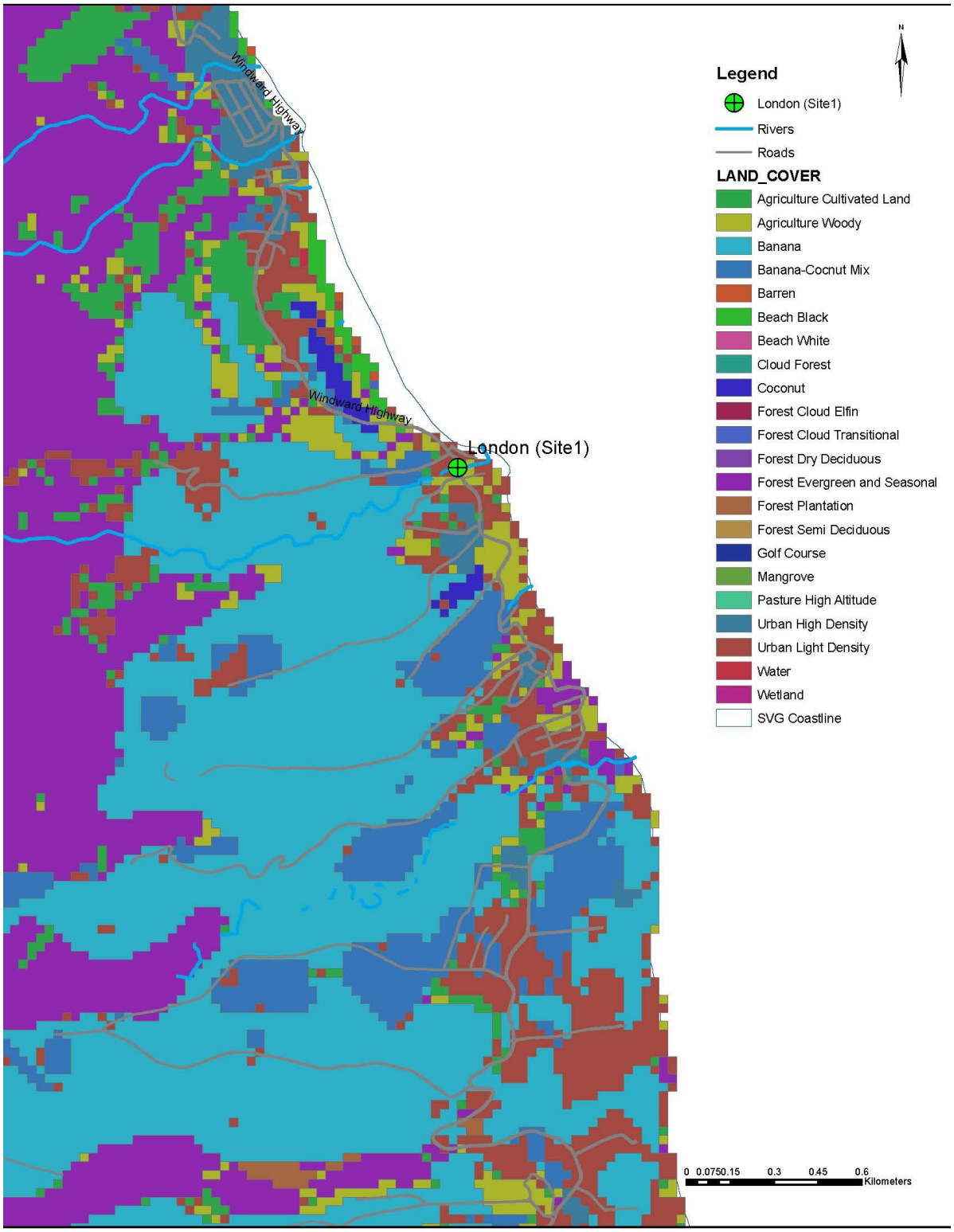
SVG has approximately 12,700 hectares of tropical forest, including primary and secondary rainforest, elfin woodland, palm brakes, littoral woodland, dry scrub woodlands and mangrove. These vegetation types encompass 1,150 species of flowering plants (including 16 endemic species) and 163 species of ferns of which 4 are endemic. Table 4-5 provides descriptions of the different vegetation types found in SVG.

TABLE 4-5: DESCRIPTION OF VEGETATION TYPES IN SVG

VEGETATION TYPE	DESCRIPTION
Rain Forest	Confined to areas of high elevation (300 m – 500 m) that experience high rainfall (more than 100 mm of rainfall per month) with very short dry periods. Such areas are mainly in the middle to upper watershed basins of the Colonarie, Cumberland and Buccament valleys. Dominant rainforest flora includes *Prestoea montana, Dacryodes excelsa, Lauraceae* species*, Meliosina herbertii, Micropholis chrysophylloides* and *Sloanea caribaea*.
Secondary Rain Forest	Forested areas which have been disturbed, either by anthropogenic activity or natural disasters such as hurricanes or volcanic eruptions. Hence, secondary forest is found around the Soufriere mountains.

VEGETATION TYPE	DESCRIPTION
	Secondary tree species include *Chimarrhis cymossa, Sapium caribeum, Inga ignoides, Cecropia peltata, Freziera hirsuta, Ochroma pyramidale, Cordia sulcata* and *Lauraceae* species.
Elfin Woodlands	Found on summits above 500 m on both windward and leeward sides on the central mountain. Dominant trees include *Charianthus cocconeus, Didymopanax attennatum, Freziera hirsuta, Prestoea montana, Inga laurina, Weinmannia pinnata, Ficus and Clusia* species which are covered with moss and epiphytes.
Palm Brakes	Referred to as *"Cloud Forest",* occurs between rainforest and elfin woodland. It mainly comprises of Palm trees reaching up to 12 m in height.
Littoral Woodlands	Primarily exist as narrow strips along the eastern coastline. Vegetation comprises of salt tolerant trees such as Sea Grape (*Coccoloba unifer)*, *Tabebuia pallida* and *Rheedia* species.
Dry Scrub Woodlands	Occur in the drier coastal areas particularly steep rocky slopes. Dominant tree species include *Bursera simaruba, Pisonia fragrans, Acrocima* species. Other tree species found in these areas include: *Tabebuia pallida, Swietenia mahogani, Hymenaea courbaril, Pouteria multiflora, Inga laurina, Mastichodendron, feutidissimum, Brosimum alicastrum* and the *Lauraceae* species.
Mangrove	A very small area of mangrove exists in the southern portion of St. Vincent. White Mangrove *(Laguncularia racemose)* is the dominant species in this area.

According to the Land Cover Map of St. Vincent, the vegetation surrounding the London bridge primarily comprises of Agriculture woody trees (see Figure 4-14). During field reconnaissance, floral species noted at the project site were Coconut *(Cocos nucifera),* Breadfruit *(Artocarpus altilis)* (see Photograph 4-2), Seaside Grape (Coccoloba unifer), Seaside Almond *(Terminalia catappa)*, Trumpet Tree *(Cecropia peltate)*, *(*Wild Ochro *(Abelmoschus sp.)* (see Photograph 4-3) and Banana *(Musa sp.)*.



Source: GIS Unit, Physical Planning Unit, Ministry of Transport, Works, Lands and Surveys, and Physical Planning Accessed for Project in 2023

FIGURE 4-14: LAND COVER

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PHOTOGRAPH 4-2:BREADFRUIT TREE AND COCONUT TREES

PHOTOGRAPH 4-3: WILD OCHRO

4.3.2 Terrestrial Fauna

Information in this section is presented under the following headings:

- Avifauna;
- Mammals;
- Herpetofauna;
- Invertebrates and
- Riverine Fauna

It should be noted that fauna in SVG includes some species which are endemic to the island or endemic to the Caribbean region and species which have been introduced to the island by humans.

4.3.2.1 Avifauna

One hundred and ninety species of birds have been recorded in SVG. There are two endemic birds on St. Vincent, the St. Vincent Parrot (*Amazona guildingii*) and the Whistling Warbler (*Catharopezea bishopi*)[1]. The latter is typically found in areas of primary, elfin and palm brake forests (300 m – 500 m) such as Richmond Peak and the Colonaire and Perseverance valleys. The St. Vincent Parrot, the country's national bird is confined to the mountain forest, mainly Buccament, Cumberland and Wallilibou valleys.

[1] https://nationalparks.gov.vc/nationalparks/index.php/biodiversity

In addition to these two endemic species, several species of land and sea birds are protected under the second schedule of the Wildlife Protection Act 1991. These include birds of the following genera: *Cichlherminia, Allenia, Myiadestes, Setophaga, Euphonia, Sicalis, Myiarchus, Elainea, Chaetura, Cypseloides, Pandionidae, Amazona, Butorides, Nycticorax, Gallinula, Ionornis, Gelochelidon, Anous* and *Oceanites*. Furthermore, several other species are partially protected, that is, they may be hunted during the hunting season by persons who have been granted a Special Hunting License by the Chief Wildlife Protection Officer. These include wild pigeons, doves, quails, cocorico and shorebirds.

During field reconnaissance, bird species recorded at the project site included Bananaquit *(Coereba flaveola)*, Black-faced Grassquit (*Tiaris bicolor)*, Gray Kingbird (*Tyrannus dominicensis)*, Common Ground Dove *(Columbina passerine)*, Spectacled Thrush *(Turdus nudigenis)* and Magnificent Frigatebird *(Fregata magnificens)*.

4.3.2.2 Mammals

Terrestrial mammals found in SVG include several species of Bats (nine Bat species are found in St. Vincent) and six non-volant mammals which were introduced to the island. These include Agouti (*Dasyprocta agouti*), Armadillo (*Dasypus novemcinctus*), Manicou (*Didelphis marsupialis*), Mongoose (*Herpestes auropunctatus*), House Mouse (*Mus musculus*) and two species of Rats, (*Rattus rattus* and *Rattus norvegicus*). It should be noted that the Rice Rat (*Oryzomys victu*), now extinct, was endemic to St. Vincent.

Under the third schedule of the Wildlife Protection Act (1991), Agouti, Armadillo and Manicou are listed as Partially Protected Wildlife and therefore can only be hunted during the hunting season by persons who have been granted a Special Hunting License by the Chief Wildlife Protection Officer. However, Bats, Mice, Rats and Mongoose are listed as Vermin under the sixth schedule of the act and therefore may be hunted and destroyed at any time without license.

Though no direct surveys for mammals were conducted as part of this ESIA, it should be noted that there is potential for the presence of bats and non-volant species within agricultural and woodland areas close to the project site due to favourable habitat and food sources.

4.3.2.3 Herpetofauna

Four species of Amphibians and 21 species of Reptiles are found in SVG. Amphibians include the marine toad (*Bufo marinus*), two tree frogs (*Eleutherodactylus johnstonei* and *Eleuthrodactylus shrevei*) and the pond frog (*Leptodactylus wagneri*)[1].

Reptiles include three gecko lizards, two anole lizards, two ground lizards, an iguana, a skink and three snakes. The snakes {Meadow snake (*Leimadophis ornatus*), Black snake (*Chironiun vincenti*) and Congo Snake (*Corallus enhydris cooki*) and the St. Lucia Whiptail lizard (*Cuemidophorus vanzoi*)} are protected under the Wildlife Protection Act 1991 and therefore should not be hunted, damaged, sold, or kept as pets. The iguana is partially protected and therefore may be hunted during the hunting season by persons who have been granted a Special Hunting License by the Chief Wildlife Protection Officer.

Though no direct surveys for amphibians and reptiles were conducted as part of this ESIA, it should be noted that there is potential for the presence of all native species of amphibians and reptiles at the project site mainly within agricultural and woodland areas close to the project site.

4.3.2.4 Invertebrates

Invertebrates in SVG includes 20 species of diplopods (centipedes and millipedes), 220 species of arachnids, not including microscopic mites, 2000 species of insects, 35 terrestrial crustaceans, and 75 species of terrestrial/freshwater molluscs[1].

4.3.2.5 Riverine Fauna

In addition to the 75 species of freshwater molluscs, 25 species of freshwater fish are found in SVG[1]. Common species include Goby (*Gobisox spp*), Tri Tri (*Sicydium plumeri*), Mountain Mullet (*Agonostomus monitcloa*) and Flathead Mullet (*Mugil cephalus*). It should be noted that during field reconnaissance, no water was present in the Agrika River.

4.3.3 Marine Biodiversity

Over 1200 marine species can be found in the waters surrounding St. Vincent and the Grenadines. This includes 11 species of seaweed and 30 species of corals, 450 species of finfish, 12 species of whales and dolphins, 9 species of gastropods, 800 species of marine molluscs and 4 species of turtles {Hawksbill (*Eretmochelys imbricata*), Green (*Chelonia mydas*), Loggerhead (*Caretta caretta*) and Leatherback (*Dermochelys coraica*)} (St. Vincent and The Grenadines Sixth National Report to the Convention on Biological Diversity 2019). Though it could not be confirmed, it is considered likely that some of these marine species may be present in the vicinity of the project sites.

During the water quality monitoring exercise, Limpets and Zagaya Rock crabs (*Grapsus grapsus*) were observed on rocks at the outfall of the Agrika River.

PHOTOGRAPH 4-4: LIMPETS ON ROCK AT WATER QUALITY MONITORING LOCATION AT LONDON

4.3.3.1 Fisheries

The closest fish landing sites to the project site are situated in Sandy Bay, Owia and Fancy (see Figure 1-1). Data on the quantity of fish landed and the value of fish marketed at these sites for the period January 2018 to June 2022 was obtained from the Fisheries Division of the Ministry of Agriculture, Forestry, Fisheries, Rural Transformation, Industry and Labour.

During this time period, the largest quantity of fish was landed at Owia whilst the least was landed at Fancy (see Table 4-6). It should also be noted that during the period 2018 to 2022, 2020 was the most profitable year (see Table 4-7).

Fish species caught in St. Vincent include:

- Net Fishing - Robin (*Decapterus macarellus*) (50,000 kg), balahoo (*Hemiramphus unifasciatus*) and jacks (*Selar crumenopthalmus*) (89,000 kg) are the most common species captured in this way.

- Deep Sea Fishing - dolphins, yellow fin tuna, skip jacks and kingfish.

- Lobsters and Conchs

TABLE 4-6: ESTIMATED WEIGHT OF FISH LANDED AT FANCY, OWIA AND SANDY BAY DURING THE PERIOD JANUARY 2018 TO JUNE 2022

YEAR	FANCY	OWIA	SANDY BAY
	EST. TOTAL WEIGHT OF FISH LANDED (KG)		
2018	0	86782.56	4440.53
2019	1989.17	49861.6	4792.7
2020	1241	253423.51	10103.8
2021	4920	141137.99	11482.33
2022	5802.5	21035.36	25765
Total	13952.67	**552241.02**	56584.36

TABLE 4-7: ESTIMATED EARNINGS OF FISH MARKETED AT FANCY, OWIA AND SANDY BAY DURING THE PERIOD JANUARY 2018 TO JUNE 2022

YEAR	FANCY	OWIA	SANDY BAY
	EST. TOTAL EARNINGS OF FISH MARKETED (EC$)		
2018	0	441792.26	34984.14
2019	13924.17	312494.89	35654.29
2020	9990	1182254.38	73970.4
2021	33060	765375.97	86679
2022	45902.5	160030.18	218529.5
Total	$ 102,876.67	**$ 2,861,947.68**	$ 449,817.33

4.3.3.2 Turtle Nesting Data

As mentioned in Section 4.3.3, four species of turtles {Hawksbill (*Eretmochelys imbricata*), Green (*Chelonia mydas*), Loggerhead (*Caretta caretta*) and Leatherback (*Dermochelys coraica*)} can be found in the waters surrounding St. Vincent and the Grenadines. For many years, these sea turtles have been exploited for their meat, eggs and shells. However, in response to the increased global threat to sea turtles, the Ministry of Agriculture, Forestry, Fisheries and Rural Transformation imposed a total ban on the killing of sea turtles in St. Vincent and the Grenadines as of January 1st, 2017. A national Sea Turtle Conservation Program is now being executed to make turtle watching a viable eco-tourism opportunity in rural coastal communities such as Sandy Bay[2].

Turtle nesting data collected along the north-eastern coastline of St. Vincent for the period 2018 onwards was obtained from the Fisheries Division of the Ministry of Agriculture, Forestry, Fisheries, Rural Transformation, Industry and Labour. The Division has a regular monitoring program for Big Sands Beach, Sandy Bay and data is also collected by dedicated volunteers in Colonaire, Byrea, Gorse, San Souci and Owia. It should be noted that no data is available for 2021, as the eruption of the Soufriere Volcano impacted data collection. Nonetheless, for the period 2018 onwards, the most common species observed at all nesting sites was the Leatherback with Big Sands Beach, Sandy Bay being the most popular nesting site. Apart from the Leatherback, the only other species observed was the Hawksbill (see Table 4-8). It should be noted that while Sandy Bay is a popular nesting site, it is unlikely that turtles will come ashore at the outfall of the Agrika

[2] https://www.iwnsvg.com/2017/01/06/total-ban-on-killing-sea-turtles-in-effect-in-st-vincent/

River, just downstream of the proposed London bridge as large rocks along the coastline make the area unsuitable for nesting.

TABLE 4-8: TURTLE NESTING DATA 2018-2023

YEAR	NESTING BEACH	SPECIES	ACTIVITY OUTCOME	FREQUENCY	TOTAL RECORDED ACTIVITIES
2018	Big Sands	Leatherback (*Dermochelys coriacea)*	Nested	32	38
		Leatherback (*Dermochelys coriacea)*	Attempted	2	
		Leatherback (*Dermochelys coriacea)*	False Crawl	1	
		Hawksbill (*Eretmochelys imbricata*)	Nested	3	
	Colonaire	Leatherback (*Dermochelys coriacea)*	Nested	6	15
		Leatherback (*Dermochelys coriacea)*	False Crawl	2	
		Leatherback (*Dermochelys coriacea)*	Unknown	5	
		Leatherback (*Dermochelys coriacea)*	Attempted	1	
		Hawksbill (*Eretmochelys imbricata*)	Unknown	1	
	Byrea	Leatherback (*Dermochelys coriacea)*	False Crawl	1	1
	Sans Souci	Leatherback (*Dermochelys coriacea)*	Nested	2	2
2019	Big Sands	Leatherback (*Dermochelys coriacea)*	Nested	27	28
		Leatherback (*Dermochelys coriacea)*	Unknown	1	
	Colonaire	Leatherback (*Dermochelys coriacea)*	Nested	4	5
		Leatherback (*Dermochelys coriacea)*	Death	1	
2020	Big Sands	Leatherback (*Dermochelys coriacea)*	Nested	18	21
		Leatherback (*Dermochelys coriacea)*	False Crawl	1	
		Hawksbill (*Eretmochelys imbricata*)	Nested	2	
	Colonaire	Leatherback (*Dermochelys coriacea)*	Nested	2	5
		Leatherback (*Dermochelys coriacea)*	Attempted	1	
		Leatherback (*Dermochelys coriacea)*	False Crawl	1	
		Leatherback (*Dermochelys coriacea)*	Unknown	1	
	Gorse	Leatherback (*Dermochelys coriacea)*	Nested	1	3
		Leatherback (*Dermochelys coriacea)*	Unknown	2	
	Byrea	Leatherback (*Dermochelys coriacea)*	Attempted	1	2
		Leatherback (*Dermochelys coriacea)*	Unknown	1	
2021	***No data***				0
2022	Big Sands	Leatherback (*Dermochelys coriacea)*	Nested	30	30
	Colonaire	Leatherback (*Dermochelys coriacea)*	Nested	4	16
		Leatherback (*Dermochelys coriacea)*	False Crawl	5	
		Leatherback (*Dermochelys coriacea)*	Unknown	7	
	Byrea	Leatherback (*Dermochelys coriacea)*	Nested	2	3
		Leatherback (*Dermochelys coriacea)*	Attempted	1	

YEAR	NESTING BEACH	SPECIES	ACTIVITY OUTCOME	FREQUENCY	TOTAL RECORDED ACTIVITIES
	Gorse	Leatherback (*Dermochelys coriacea)*	Nested	3	4
		Leatherback (*Dermochelys coriacea)*	Unknown	1	
	Owia	Hawksbill *(Eretmochelys imbricata)*	Nested	1	1
2023	Big Sands	Leatherback (*Dermochelys coriacea)*	Nested	18	18

4.3.4 Endemic, Rare or Threatened Species

Fauna in SVG includes some species which are endemic to the island or endemic to the Caribbean region (see Table 4-9). It should be noted that the only endemic species recorded at the project site during field reconnaissance was the St. Vincent Anole (*Anolis trinitatus*).

TABLE 4-9 : ENDEMIC SPECIES

SPECIES	STATUS / HABITAT
FLOWERING PLANTS	
Trigynaea antillana	Endemic to St. Vincent and the Grenadines/High Elevations
Meliosoma herbertii	
Calliandra guildingii	
Psidium guildingianum	
Gustavia antillana	
Tibouchina cistoides	
Begonia pensilis	
Hoffmannia tubiflora	
Malouetia retroflexa	
Columnea speciosa	
Peperromia cuneata	
Peperomia vincentiana	
Croton guildingii	
Epidendrum vincentinum	
Tillandsia megastachya	
Spachea perforata	
FERNS	
Diplazium godmani	Endemic to Lesser Antilles / woodland at high elevations plant rare
Elaphoglossum smithii	Endemic to Lesser Antilles; St. Vincent & Grenada / High elevations very rare
Cyathea tenera	Not Stated
Pteris longibrachiata	Not Stated
MAMMALS	
Oryzomys victus (Rice rat)	Extinct
Monophyllusplethodon luciae	Endemic to the Lesser Antilles

SPECIES	STATUS / HABITAT
Ardops nichollsi luciae	
Brachyphylla cavemarum cavemarum	
REPTILES	
Sphaerodactylus kirdyi	Bequia / apparently rare
Anolis griseus	forested areas / status unknown
Anolis trinitatus	forested areas / status unknown
Chironius vincenti	forested areas / status unknown but not rare
Sphaerodactylus vincenti	Regional endemic
Gymnophathalmus underwoodi	Regional endemic
Mastigodryas bruesi	Regional endemic
AMPHIBIANS	
Eleutherodactylus shrevei	Forested interior, most common at altitudes >300 m / status unknown
BIRDS	
Amazona guildingii (St. Vincent Parrot)	Undisturbed rainforest (Buccament, Colonaire and Cumberland)
Catharopezea bishop (Whistling Warbler)	Elfin and Palm Brake Forests.

In addition to local and regional endemics, several threatened species can be found in SVG, 1,523 are listed on the IUCN Red List of Threatened Species (St. Vincent and The Grenadines Sixth National Report to the Convention on Biological Diversity 2019). Table 4-10 provides a summary of the status of SVG species listed on the IUCN Red List.

TABLE 4-10: STATUS OF SVG SPECIES LISTED ON THE IUCN RED LIST.

STATUS	NUMBER OF SPECIES
Extinct	1
Critically Endangered	7
Endangered	14
Vulnerable	43
Near Threatened	33
Least Concern	1347
Data Unavailable	78

Of the 21 critically endangered and endangered species, five are endemic to SVG. The include the St. Vincent Black Snake *(Chironius vincenti)*, Union Island Gecko *(Gonatodes daudini)*, St. Vincent Whistling Frog *(Pristimantis shrevei)*, Whistling Warbler *(Catharopeza bishop)* and Grenada Worm Snake *(Amerotyphlops tasymicris)*.

4.3.5 Protected Areas

To date, thirty-five (35) protected areas in SVG have been established under different legislation including the Forest Resources Conservation Act (1992), the Wildlife Protection Act (1987), and the Fisheries Act (1986). These include wildlife reserves, forest reserves and marine parks, reserves and conservation areas.

No protected areas are situated in close proximity to the project site and therefore they will not be affected by project activities.

4.3.5.1 Wildlife Reserves

Twenty-four (24) Wildlife Reserves have been established under the first schedule of the Wildlife Protection Act, 2002. These consist of 8 areas in St. Vincent and 16 areas in the Grenadines. The largest and most important of these is the 7,596 acre (3075 ha) St. Vincent Parrot Reserve situated in the central mountain range of St. Vincent which is intended to protect the endangered St. Vincent Parrot (*Amazona guildingii*). Other wildlife reserves in St. Vincent include the King's Hill Forest Reserve, the Falls of Baleine, the Botanical Gardens and adjacent grounds of Government House and four offshore islands; Chateaubelair Islet, Young Island, La Paz Rock and Milligan Cay.

It should be noted that none of these wildlife reserves are situated in close proximity to the project site and therefore will not be affected by project activities.

4.3.5.2 Forest Reserves

In 1912, all Crown lands in St Vincent 1,000 ft (330m) above sea level was reserved to protect forests in the upper watersheds. This area is estimated to be 40 percent of the mainland's total land area. Following this, in 1948 the Crown Lands Forest Reserve Order established the Soufriere, Mesopotamia and Colonarie Forest Reserves and in 1992, the Cumberland, Kings Hill and Tobago Cays Forest Reserves were established under the Forest Resource Conservation Act.

According to information accessed on the National Parks, Rivers and Beaches Authority website, other designated forest reserves in St. Vincent include Richmond, Mt. Pleasant and Dalaway reserves. Proposed forest reserves include Kingstown and Campden Park reserves[3].

It should be noted that the project site is situated along the northern segment of the Windward Highway and therefore is not within or in close proximity to any forest reserve.

[3] https://nationalparks.gov.vc/nationalparks/images/documents/Protectedareas.pdf

4.3.5.3 Marine Conservation Areas

There are 10 Marine Conservation Areas in St. Vincent and the Grenadines. However, only one (Indian Bay/Villa/Calliaqua/Blue Lagoon) is on mainland St. Vincent. This marine conservation area is situated on the southern coastline and therefore will not be affected by project activities.

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5 SOCIOECONOMIC ENVIRONMENT

This chapter presents information on the socioeconomic environment. The purpose of the social baseline study is to facilitate a comprehensive understanding of the human environment and systems that would inform the impact assessment process. The study involved the review and analysis of secondary information derived from official sources, including the Statistical Office of St. Vincent and the Grenadines, the European Union (EU) and the Caribbean Development Bank (CDB) Caribbean Disaster Risk Reduction Fund (CDRRF), and other government reports and statistics. In addition, the study included the analysis of primary information collected during online semi-structured interviews with government departments, NGOs and communities. The conduct of community interviews/discussions and windshield surveys increased local awareness of the bridges subproject and provided opportunities for participating residents to share information on the existing community conditions, identify the subproject's potential impacts and express their requirements for bridge design. Given the need to promote social development and inclusion in development interventions[4], the baseline study, where data was available, considers location, gender, age, disability (ability), occupation, poverty, and other critical high-risk factors that may exclude the participation of some populations of the communities in the area of influence.

Information on the socioeconomic environment is presented under the following headings:

- Background;
- Area of Influence;
- Historical and Cultural Development of the AOI Communities;
- Locational Setting of the AOI Communities;
- Population Dynamics and Characteristics;
- Sex of Head of Household;
- Education and Demography;
- Household Characteristics;
- Land Use and Acquisition;
- Cultural Characteristics and Resources;
- Economic Activities and Resources;
- Road Network;
- Health Facilities and Conditions;
- Educational Infrastructure and Access to Education;
- Water Supply and Sanitation;
- Access to Energy;
- Sports and Recreation Facilities and;
- Safety and Security.

[4] Government of St. Vincent and the Grenadines – National Economic and Social Development Plan 2013-2025, Goal Two: Enabling Increased Human and Social Development, p64-68.

5.1 Background

St. Vincent and the Grenadines is a Small Island Developing State (SIDS) with all the inherent challenges, such as a narrow economic base and high vulnerability to external shocks and natural disasters. St. Vincent and the Grenadines is recorded as having High Human Development. In the past, St. Vincent and the Grenadines relied almost exclusively on agriculture, but in recent times, tourism and related services, construction and other sectors have become increasingly important contributors to the national economy.

The explosive eruption of the La Soufrière volcano in April of 2021 directly affected a number of communities, including those north of the Rabacca River (Orange Hill, Magum, Touroma, Overland, Sandy Bay, Owia, and Fancy) as well as Georgetown. Integrated Volcanic Hazard Zones are presented in Figure 5-1. Prior to the eruption, over 15,000 families (including children and older adults (the elderly), persons with disabilities, and the chronically ill, were evacuated and displaced from their homes in the designated red zone in the northern part of St. Vincent, where the volcano is located. In addition to the displacement of families and the disruption of people's lives in the communities, the eruptions directly affected the road network. Accumulated ash collapsed several residential roofs, damaged public infrastructure, and disrupted several essential services networks, including the water supply.

Agriculture, the mainstay of the communities north of Rabacca, was disrupted by the volcanic eruptions but has been returning slowly to pre-eruption levels. Arrowroot production, for which the Over-the-River communities are famous, was seriously curtailed with the destruction of the Arrowroot Factory in Owia and the halting of the construction of a modern factory in Orange Hill. Farmers were forced to leave the arrowroot rhizomes in the ground. However, the construction of the factory has since resumed.

5.2 Area of Influence

In considering the social areas AOIs, it is important to identify the AOIs affected by direct impacts and the AOIs subject to indirect impacts. The AOIs for direct impacts include the households, landowners, land users, and institutions, as well as community livelihoods and social and cultural activities that fall within or are close to the footprints of the project site and the associated infrastructure. These areas also include populations 1) within the environmental AOIs and 2) those that will be indirectly affected by activities not under the control of the subprojects but are triggered by its implementation. Therefore, apart from Overland and Sandy Bay (London), where the new bridge will be constructed, the AOIs also include the communities of Owia and Fancy, whose residents will utilise the bridge. Building this concrete bridge along the North Windward Highway to replace the existing crossing at London will facilitate access to and from the communities.

Geographically, the AOIs for the indirect impacts focus on two Census Divisions – the Sandy Bay Census Division, where most of the country's indigenous people reside, and the Georgetown Census Division.

5.3 Historical and Cultural Development of the AOI Communities

The communities north of the Rabacca River developed from the privately owned agricultural estates once established in the region. These large tracts of land were purchased by the Government and subdivided into smaller lots that were then leased to persons who worked on the estates. The workers were given two lots, one for agriculture and another to build a home, with the house plots located close to the Windward Highway and the agricultural plots located further inland on the mountainside.

The history of the North Windward communities, along with its cultural traditions and practices, is closely linked to the country's indigenous people. Today, most of the indigenous population of St. Vincent and the Grenadines reside in the AOI.

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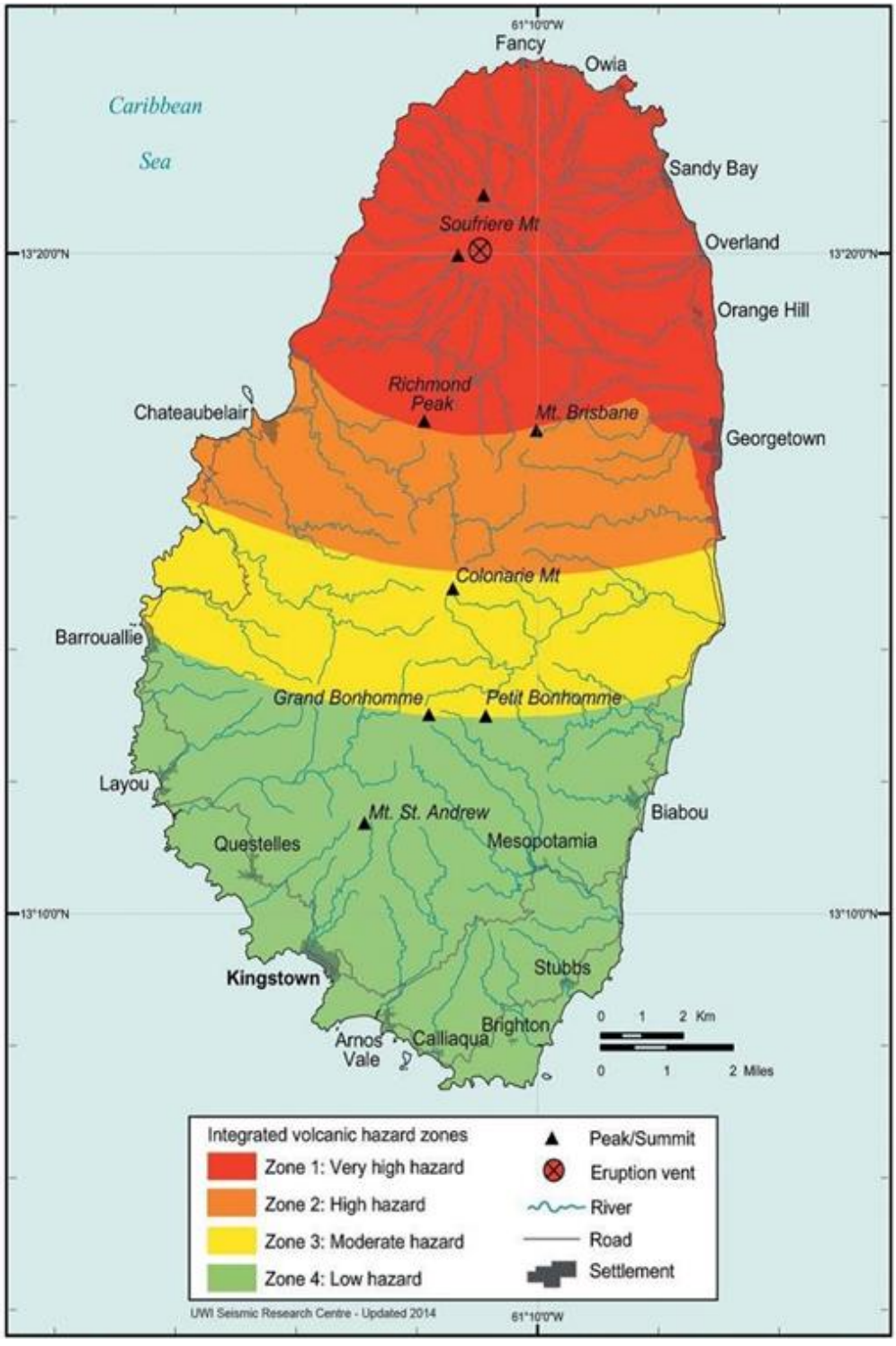

Source: NEMO, 2021

FIGURE 5-1: VOLCANIC HAZARD ZONES

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5.4 Locational Setting of the AOI Communities

Overland, Sandy Bay, Owia and Fancy are coastal communities in the North Windward region of St. Vincent and the Grenadines, accessible by land and sea. The distance between Overland and Fancy spans about 11.75 km, with Fancy the farthest village located 19.47 km (or an average of 42 minutes) from Georgetown or 50.21 km (or an average of 1.5 hours) from Kingstown. The communities are situated in the Parish of Charlotte which is the largest parish in the country (see Figure 5-2 and Table 5-1). While Sandy Bay, Owia and Fancy are located in the Sandy Bay Census Division, Overland is located in the Georgetown Census Division.

TABLE 5-1: THE COMMUNITIES OF OVERLAND, SANDY BAY, OWIA AND FANCY

COMMUNITY	SUBSECTIONS[1]	SUMMARY
Overland	Overland, Tourama, Magum	Overland is an agricultural community located between Orange Hill to the south and Sandy Bay to the north.
Sandy Bay	Point, Old Sandy Bay, Sion Hill, Trench Town, Big Sandy Bay, Pepper Village, Level Side, Noel, London	Sandy Bay is a farming and fishing community with Owia located to the north and Overland to the south.
Owia	Bottom Town, Top Village, Ball Ground, Cross Road, Hill, Barrack, Wharf	Owia is an agricultural community, with Fancy found to the north and Sandy Bay to the south. Traditionally, the community is known for cultivating arrowroot and root crops like sweet potato. Prior to the eruption of La Soufrière, it was the location of St. Vincent's only arrowroot factory.
Fancy	Dry River (Faria), Nigger House, Big Gutter, Cottage, Big Level (Fancy Cane Garden)	Fancy is an agricultural and fishing community traditionally known for farine production. Fancy is the last northern community along the Windward Highway.

[1]As identified by the Department of Community Development and residents

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FIGURE 5-2: COMMUNITIES WITHIN THE AREA OF INFLUENCE

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5.5 Population Dynamics and Characteristics

According to the 2012 Population and Housing Census, the total population of the Sandy Bay Census Division stood at 2,576 persons and comprised 1,374 males and 1,232 females, with a gender ratio (male to female) of 1.09. The Sandy Bay population represented 2.4 percent of the total population of St. Vincent and the Grenadines. In the case of the Georgetown Census Division, the total number of persons was 7,049 persons, representing 6.5 percent of the country's total population. The total male population was 3,596, while the female population was 3,453, reflecting a gender ratio of 1.04 (see Table 5-2).

The Statistical Office 2012 Census data is disaggregated by enumeration districts. The 2012 Census revealed that Orange Hill/Overland had 448 households and a population of 1,766 persons. The average household size recorded 3.9 persons per household. The enumeration districts of Sandy Bay and Old Sandy Bay and Owia were the most populated areas in the Sandy Bay Census Division, with a combined population of 1,852 persons and an average household size of 4.1 persons for the two districts.

TABLE 5-2: POPULATION AND HOUSEHOLD SIZE BY ENUMERATION DISTRICTS, 2012

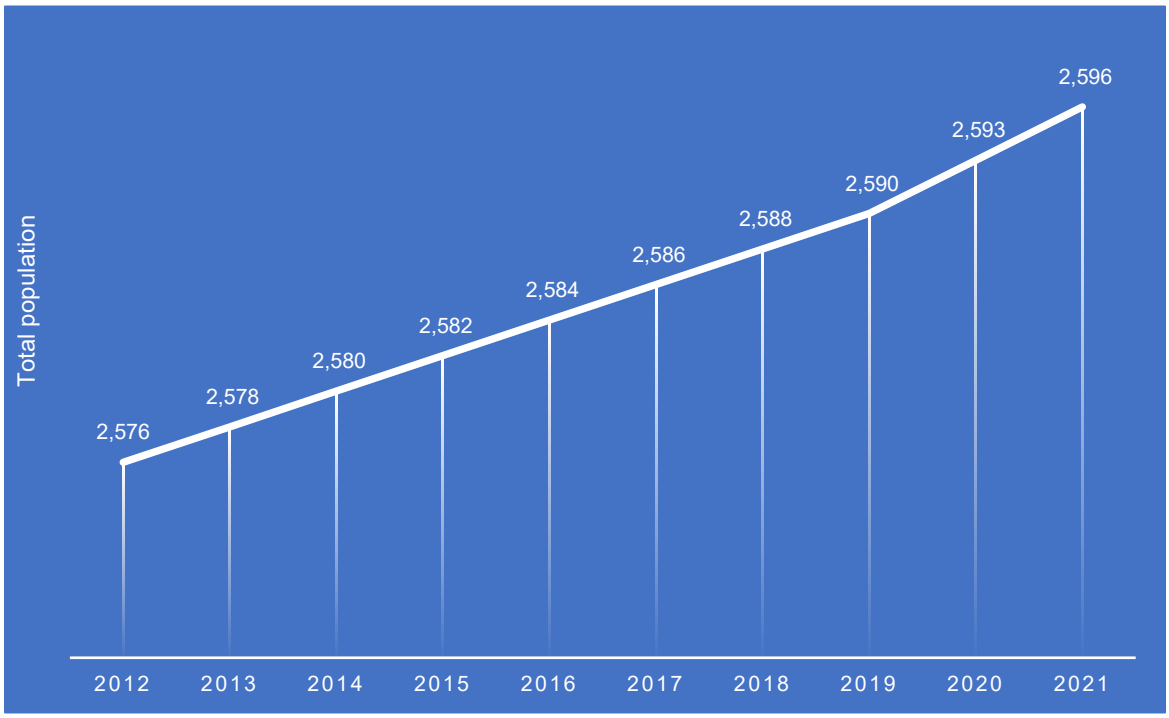
ENUMERATION DISTRICTS	HOUSEHOLD	MALE	FEMALE	TOTAL	SEX RATIO	PERSONS/ HOUSEHOLD
Waterloo, Orange Hill and Tourama (7150)	106	180	146	326	1.23	3.1
Overland and Big Level (7161, 7162, 7163)	342	734	706	1,440	1.04	4.2
Total	***448***	***914***	***852***	***1,766***	***1.07***	***3.9***
Georgetown Census Division	***2,070***	***3,596***	***3,453***	***7,049***	***1.04***	***3.4***
Sandy Bay (8010, 8020, 8030)	231	484	461	945	1.05	4.1
Old Sandy Bay and Point (8051)	62	119	115	234	1.03	3.8
Old Sandy Bay and Owia (8052, 8053)	219	486	421	907	1.15	4.1
Fancy (8060)	150	255	235	490	1.09	3.3
Total	***662***	***1,344***	***1,232***	***2,576***	***1.12***	***3.9***
Sandy Bay Census Division	***662***	***1,344***	***1,232***	***2,576***	***1.12***	***3.9***
Mainland	***32,398***	***49,814***	***48,676***	***98,490***	***1.02***	***3.0***
St. Vincent and the Grenadines	***36,829***	***55,835***	***53,353***	***109,188***	***1.05***	***3.0***

Source: Statistical Office of St Vincent and the Grenadines 2012 Population and Housing Census

The household population data for the Sandy Bay Census Division for the last three Censuses (1991, 2001 and 2012) showed an increase of 0.4 percent between the 1991 and 2001 Censuses and a decline of 8.2 percent for the intercensal period from 2001 to 2012. In contrast, the Georgetown Census Division showed a 4.6 percent decline in total population for the 1991 to 2001 period and an increase of 1.2 percent between 2001 and 2012.

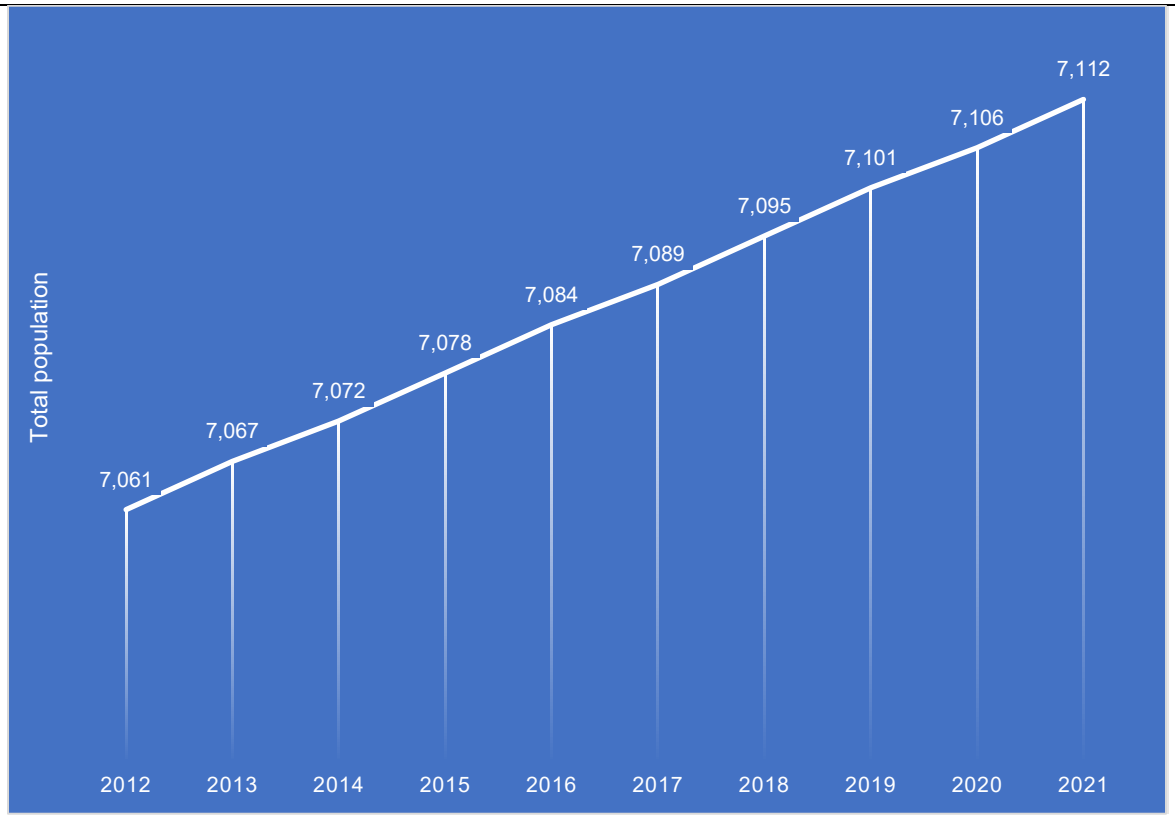
The total mid-year population estimates for the Sandy Bay and Georgetown Census Divisions for 2012 to 2021 showed a less than 1 percent increase in population size, moving from 2,756 persons in 2012 to 2,956 persons in 2021 (Figure 5-3). In comparison, changes in the total population of St. Vincent and the country showed a similar trend as the Sandy Bay Census Division, with a predicted 1 percent increase in population.

With an area of about 5.3 square miles for the Sandy Bay Census Division and 22.2 square miles for the Georgetown Census Division, the population densities of the two regions were 486 persons and 318 per square mile, respectively, making them two of the country's least densely populated geographic regions.



Source: Statistical Office of St Vincent and the Grenadines 2012 Population and Housing Census

FIGURE 5-3: ESTIMATED TOTAL MID-YEAR POPULATION OF SANDY BAY CENSUS DIVISION, 2012-2021



Source: Statistical Office of St Vincent and the Grenadines 2012 Population and Housing Census

FIGURE 5-4: ESTIMATED TOTAL MID-YEAR POPULATION OF SANDY BAY AND GEORGETOWN CENSUS DIVISIONS, 2012-2021

The 2012 Population and Housing Census Report noted that ethnicity, religion, and place of birth, among other demographic characteristics, are often used to characterise the identity and cultural affiliation of persons in a population.

5.5.1 Ethnicity

Persons of Mixed Ethnicity (42.7%) were the main ethnic group in the Sandy Bay Census Division, followed by Indigenous Peoples (38.4%) (Table 5-3). In contrast, the majority of persons in the Georgetown Census Division were of African descent (60.1%), with persons of Mixed Ethnicity accounting for 25.6 percent of the total population.

TABLE 5-3: TOTAL POPULATION BY ETHNICITY, 2012

CENSUS DIVISION	ETHNIC GROUPS							
	AFRICAN	INDIGENOUS PEOPLES	WHITE/ CAUCASIAN	EAST INDIAN/ INDIAN	MIXED	PORTUGUESE	OTHER	TOTAL
Sandy Bay								
(N)	472	988	3	8	1,101	4	0	2,576
(%)	18.3	38.4	0.1	0.3	42.7	0.2	0.0	100.0
Georgetown								
(N)	4,239	866	9	73	1,803	53	6	7,049
(%)	60.1	12.3	0.1	1.0	25.6	0.8	0.1	100.0
Total								
(N)	77,764	3,280	889	1,199	25,111	753	192	109,188
(%)	71.2	3.0	0.8	1.1	23.0	0.7	0.2	100.0

Source: Statistical Office of St Vincent and the Grenadines 2012 Population and Housing Census

5.5.2 Religion

Most persons residing in the Sandy Bay and Georgetown Census Divisions reported they were Christians. Most persons in the Divisions indicated they were Pentecostal (33.7% and 30.3%, respectively). Anglicans were the second largest Christian domination in both Divisions (23.4% and 16.3%, respectively). Persons in the Sandy Bay Census Division (10%) and Georgetown Census Division (13.1%) who indicated they were Spiritual Baptists were the third largest religious population residing in the two regions.

5.5.3 Place of Birth

Most of the persons who are residents in the Sandy Bay and Georgetown Census Divisions were born there. At 87.4 percent, the residents of Sandy Bay were among the Census Divisions with the highest retention rates for persons born locally (see Table 5-4).

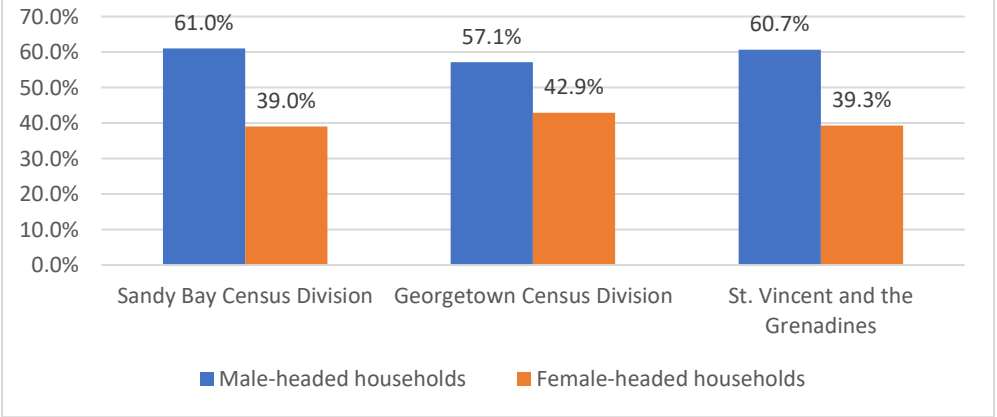
TABLE 5-4: LOCALLY BORN POPULATION BY PLACE OF BIRTH, PLACE OF RESIDENCE AND GENDER, 2012

	GEORGETOWN CENSUS DIVISION			SANDY BAY CENSUS DIVISION		
	LOCALLY-BORN RESIDENTS	TOTAL POPULATION	% LOCALLY-BORN RESIDENTS	LOCALLY-BORN RESIDENTS	TOTAL POPULATION	% LOCALLY-BORN RESIDENTS
Male	2,241	3,596	62.3%	1,125	1,344	83.7%
Female	2,131	3,453	61.7%	1,065	1,232	86.4%
Total	**4,372**	**7,049**	62.0%	**2,190**	**2,576**	85.0%

Source: Statistical Office of St Vincent and the Grenadines 2012 Population and Housing Census

5.6 Sex of Head of Household

Of the 662 households in the Sandy Bay Census Division in 2012, 61 percent were headed by men, while women headed 39 percent. In the case of the households in the Georgetown Census Division, 57.1 percent of the total households were male-headed, and 42.9 percent were female-headed (see Figure 5-4).



Source: Statistical Office of St Vincent and the Grenadines 2012 Population and Housing Census

FIGURE 5-5: SEX OF HEAD OF HOUSEHOLDS

5.7 Education and Demography

The 2012 Census data showed that in persons between ages 3 and 14 years, there were slightly more male students than female students who attended an educational institution (see Table 5-5). However, persons 15 years and older, there were more female students attending school when compared to male students. Most students were in primary and secondary school.

TABLE 5-5: POPULATION ATTENDING SCHOOL BY CENSUS DIVISION AND TYPE OF INSTITUTION, 2012

CENSUS DIVISION	PRE- PRIMARY	SPECIAL EDUCATION	PRIMARY SCHOOL	SECONDARY	TECHNICAL/ VOCATIONAL	PROFESSIONAL	COMMUNITY COLLEGE	UNIVERSITY	ADULT EDUCATION	OTHER	NOT STATED	TOTAL
Sandy Bay (N)	59	2	331	205	9	0	6	7	20	9	31	679
(%)	8.7%	0.3%	48.7%	30.2%	1.3%	0.0%	0.9%	1.0%	2.9%	1.3%	4.6%	100.0%
Georgetown (N)	186	12	749	578	13	1	67	53	12	5	147	1,823
(%)	10.2%	0.7%	41.1%	31.7%	0.7%	0.1%	3.7%	2.9%	0.7%	0.3%	8.1%	100.0%
Total (N)	2,335	113	11,243	8,481	443	139	1,020	1,114	196	322	3,020	28,426
(%)	8.2%	0.4%	39.6%	29.8%	1.6%	0.5%	3.6%	3.9%	0.7%	1.1%	10.6%	100.0%

Source: Statistical Office of St Vincent and the Grenadines 2012 Population and Housing Census

5.8 Health Status and Demography

Of the chronic illnesses reported in St. Vincent and the Grenadines in the 2012 Census, the most prevalent non-communicable diseases were Hypertension, Diabetes, Asthma, and Arthritis. Hypertension was the most reported illness in 2012, representing 10.0 percent of the population. The second most prevalently reported chronic illness was Diabetes (5.8%), followed by Asthma (5.6%) and Arthritis (4.8%). Other illnesses reported among the population were heart disease (0.9%), cancer (0.3%), stroke (0.4%) and kidney disease (0.34%). These diseases were more commonly reported among persons aged 45 – 64 and 65 and over. Table 5-6 suggests that local residents heavily subscribed to district health centers/clinics.

TABLE 5-6: PERSONS UTILIZING MEDICAL FACILITIES WITHIN PREVIOUS MONTH BY CENSUS DIVISION, 2012

CENSUS DIVISION	PUBLIC HOSPITAL	DISTRICT HEALTH CENTRES/ HEALTH CLINIC	PRIVATE DOCTOR'S OFFICE	PHARMACY	FAMILY PLANNING CLINIC	PRIVATE CLINIC/ HOSPITAL	NOT STATED	TOTAL
Georgetown (N)	280	916	377	12	1	7	25	1,618
(%)	17.3%	56.6%	23.3%	0.7%	0.1%	0.4%	1.5%	100.0%
Sandy Bay (N)	47	632	136	2	1	3	8	829
(%)	5.7%	76.2%	16.4%	0.2%	0.1%	0.4%	1.0%	100.0%
Total (N)	4,205	11,814	7,052	519	41	272	540	24,443
(%)	17.2%	48.3%	28.9%	2.1%	0.2%	1.1%	2.2%	100.0%

Source: Statistical Office of St Vincent and the Grenadines 2012 Population and Housing Census

5.9 Household Characteristics

A total of 37,000 households were recorded in St. Vincent and the Grenadines, according to the 2012 Population and Housing Census Report. With 662 households, the Sandy Bay Census Division had the lowest total household count of any Census Division, representing 1.8 percent of the national total of households. The neighbouring Census Division, Georgetown, accounted for 5.9 percent of households in the country, with 2,188 households. However, the Georgetown Census Division Enumeration Districts included in the sub-projects' AOI – Overland and Magum, Noel, London, Big Level/Level Side and Pepper Village – recorded 448 households in the 2012 Census Report. These Enumeration Districts amounted to 20.5 percent of all households in the Census Division. Using a growth rate of 13.9 percent for the period from 2012 to 2021, the Statistical Office of Saint Vincent and the Grenadines estimated the total number of households in the country to be 41,960. Out of this total, approximately 754 households were located in the Sandy Bay administrative area, and 2,493 households were located in the Georgetown administrative area.

There was a significant increase in the number of households observed in St. Vincent and the Grenadines between 1991 and 2012 (36.4%) despite the minor population growth observed nationally for that same period (2.5%). During this time, the Census Divisions encompassed within the social AOI showed a smaller household growth compared to the nation, with the number of households in the Sandy Bay and Georgetown Census Divisions growing by 15.1 and 12.4 percent, respectively. In the last intercensal period

(2001 – 2012), all Census Divisions in the county reported an increase in the number of households, apart from Sandy Bay, which showed no change in its household total. The number of households in the Georgetown Division grew by 7.8 percent in the last Census. However, the communities within the AOI in the Georgetown Census Division experienced substantial growth in their total number of households relative to the overall growth observed across the Division from 2001 to 2012. The Overland and Big Level Enumeration District witnessed a notable increase of 27.6 percent, while the Waterloo, Orange Hill, and Tourama Enumeration District saw an even more significant rise of 32.5 percent over the 11-year period.

Prior to 2001, household growth was larger and was attributed to population growth. Since then, the increase in the number of households has mainly been the result of smaller average household sizes. There has been a decline in household sizes nationally and for all Census Divisions over the last three censuses. In 2012, the average household size in St. Vincent and the Grenadines was 3.0 persons per household, down from 3.5 and 3.9 individuals per household reported in the 2001 and 1991 censuses, respectively. Sandy Bay households have consistently been the largest in the country, with households consisting of 3.9, 4.2 and 4.9 people on average in 2012, 2001 and 1991, respectively. Per the latest Census data, just under half of all households in Sandy Bay (47.4%) had between 2 and 4 individuals, while 35.0 percent contained more than 5 members. The typical household in the Georgetown Census Division, at 3.2 people per household, had a size comparable to the 2012 national average. Notably, the Division had a higher proportion of single-person households than Sandy Bay (28.6% versus 17.5%). However, households within the social AOI in the Georgetown Census Division were larger than those of the Division and similar in size (3.9 individuals per household) to households observed in Sandy Bay in 2012.

5.9.1 Heads of Households

Heads of households in St. Vincent and the Grenadines were likely to be male and middle-aged in 2012. Nationally, male-headed households were prevalent, with approximately three male household heads for every two female heads. The proportion of male-headed households in the Sandy Bay and Georgetown Census Divisions was consistent with the national distribution, as close to 60 percent of household heads were male in both Census Divisions (60.8% in Sandy Bay and 57.1% in Georgetown). Nonetheless, Georgetown had the smallest share of male household heads in the country. Nationally, most household heads fell within the age range of 35 to 64 years old (63.2%), particularly in male-headed households. Among male household heads, 65.4 percent were in this age range, while 59.8 percent of female household heads were also aged between 35 and 65 years old. Furthermore, two in five household heads were between 45 and 64 years old, with middle-aged persons representing forty percent of household heads in the Sandy Bay (41.5%) and Georgetown (40.5%) administrative areas. Notably, a significant

percentage of heads of households were older adults. In the Sandy Bay and Georgetown Census Divisions specifically, slightly over 20 percent of households were led by individuals over 65 years old.

5.9.2 Household Structure

Roughly 60 percent of persons older than 30 years old were the heads of their households in 2012 (57.9%). The older the individual, the more likely they lead their family; heads of households represented 45.3 percent of 30-44 year old, 63.7 percent of 45-64 year old and 73.1 percent of persons over 65 years old. The 2012 Census report revealed a notable trend where the heads of many extended families were above 60 years old. This is evidenced by the fact that, across the country, 27.7 percent of children (individuals younger than 15 years old) resided with their grandparents, and 10.7 percent of individuals over 30 years old lived with their parent(s), who were likely the head of the household. This pattern was more pronounced in the AOI as a higher-than-average proportion of children living with their grandparents in Sandy Bay (37.0%) and Georgetown (31.5%) Divisions. Additionally, adults in Sandy Bay (16.2%) and Georgetown (12.8%) were also more likely to live with their parents. This data suggests a significant presence of multi-generational living arrangements within households, with older generations often assuming the role of household heads and providing support to younger family members.

The 2012 Census showed that, on average, there was one child per household. The Census also indicated that children generally lived with their parent(s) who were the household heads. However, a significant number of household heads did not live with a partner or spouse (never married or had a common-law partner, not in a union or a visiting union), suggesting a likelihood of single-parent households. While 48.7 percent of household heads did not live with a partner in Sandy Bay, as much as 64.9 percent of heads of households did not live with a partner in the Georgetown Census Division. Recent stakeholder consultations have revealed that there was a high incidence of single-parent families within the AOI, commonly with households with female heads.

5.10 Land Use and Acquisition

5.10.1 Land Tenure, Land Ownership, Rights and Uses

A land tenure system is an institution that differentiates between ownership of a parcel of land and interests in land and describes the relationship among parties, as individuals or groups, with respect to land. Rules of tenure define the allocation of land rights within society by specifying how and to whom access to land is granted for its use, control and transfer, as well as corresponding responsibilities and restraints. Land tenure systems determine who can use what resources, for how long and under what conditions. Notably,

as the different “bundle of rights” to use, own and control a piece of land may not belong to one party at a given time, several people and institutions can hold different land rights over one parcel of land. These interests may intersect by overlapping, overriding, complementary or competing, sometimes leading to conflict, mismanagement, and system strain.

The total land area of St. Vincent and the Grenadines is roughly 96,000 acres. The State is a major landholder, owning approximately 60 percent of the total land area. Land and land resources are used for forestry, agriculture, industry and built development, with major land use activities including agroforestry, agriculture, mining (quarrying) and construction (housing, roads, tourism development and hard courts). Land use in the country is influenced by land topography and, to some extent, history. Moreover, the major land use activities, compounded by population growth, have placed great demand on the limited available land. However, the deciding factor in land use is ultimately land tenure, as it plays a crucial role in shaping land use decisions and practices.

5.10.2 Forestry

Forestry accounts for 47 percent of land use, some 44,819 acres, in St. Vincent and the Grenadines. The country’s climate, geology and topography, in combination with disturbances resulting from human and natural (volcanic, hurricanes, etc.) activity, have shaped ecosystems on the island. The majority of forested areas in St. Vincent are located on state land. As stated in Section 4.3.5.2, this is largely in part due to a 1912 declaration in which all land 1,000 ft (330m) above sea level was designated as Crown land and reserved by law to protect forests in the upper watersheds. This protected area amounts to some 34,000 acres or roughly 40 percent of the mainland’s total land area. Additionally, several other pieces of legislation, such as the Forest Act, 1990; The Forest Resource Conservation Act, No.47, 1992; Central Water and Sewerage Authority Act No.17 of 1991; and The Wildlife Protection Act No.16, 1987, have provided for the declaration of forested areas on state land as forest reserves, conservation areas, cooperative forests, wildlife reserves and other protective areas. There are also some tracts of forests on privately owned land as a result of the Forest Resource Conservation Act, which provides for the declaration of private land as a conservation area or cooperative forest. Most lands in the northern region of St. Vincent are Crown lands, largely with forest reserves managed by the Department of Forestry.

5.10.3 Agriculture

In the AOI, agriculture is the primary economic activity, taking advantage of the available natural resources. Farming activities are concentrated further inland from the coast, primarily on the ridges of the surrounding mountainous terrain. The sandy soil prevalent in the area is conducive to cultivating a wide range of vegetables, including cabbage, carrots, sweet pepper, tomatoes, cucumbers, melons, squash, and, to a lesser extent, lettuce. In addition to vegetables, arrowroot, coconut, and other root crops are also grown in the region. Arrowroot production is particularly prominent in Sandy Bay, Owia, and Fancy. Overland, although smaller compared to Sandy Bay, Fancy, and Owia, possesses more relatively flat land, allowing for the cultivation of fruit crops like citrus, coconut, mango, and avocado, in addition to vegetables and root crops. Plantains are commonly found in both Sandy Bay and Overland.

5.11 Cultural Characteristics and Resources

The communities within the social AOI are small farming and fishing communities with rich histories. The Sandy Bay area is predominantly composed of descendants of the indigenous Kalinago peoples (the Caribs) and the Garifunas (also referred to as Black Caribs), a mixture of Kalinago and Africans. The country's first national hero, Joseph Chatoyer, a Garifuna chief, led the rebellion against the British in the First and Second Carib wars, showcasing the resilience of the Kalinago and Garifuna communities. His memory is honoured every year on March 14th as National Heroes Day. Despite the loss of their indigenous language, the area still strongly identifies as Garifuna and "Caribs", evidenced by their self-identification during the 2012 Census and the subprojects' community discussions. Today, the communities of Overland, Magum, Sandy Bay, Fancy, and the surrounding settlements are described by residents as tightly knit with robust social cohesion, community spirit, and civil consciousness. Cultural traditions and practices thrive within these communities, and residents show high levels of interest in various forms of cultural expression and festivals.

Several cultural heritage resources are in northeast St. Vincent. Historical architecture and landscape assets of heritage importance include the Owia Gun Powder Magazine, Grand Saber/Black Point Tunnel, the Orange Hill Aqueduct, the Sandy Bay Well, the Rabacca Dry River, the Grand Saber/Black Point Tunnel, and the Old Sandy Bay/Victoria Village Heritage Trail. The Owia Salt Pond is a known natural heritage asset of note.

Owia holds significant historical importance as it was one of the main areas where the war between the British and the Black Carib (Garifuna) occurred from 1769 to 1775. The British established a military fort in Owia in 1773 to store weapons strategically at the top of the hill. Many artefacts from the war were left there until they were later relocated to a museum. The Owia Gun Powder Magazine, established in 1776, is recognized as a

heritage asset by the National Trust. It was restored in 2013 by the Caribbean Development Bank Basic Needs Trust Fund (BNTF) in collaboration with the Owia Heritage Organization Inc. Another historically significant site in Owia is the bloody bridge, situated between Espanol Point and Rouges Hill. It is the location of the final bloody battle fought between the Caribs and the British forces.

The legacy of the Indigenous peoples is demonstrated by the cultural resources associated with the AOI. Artefacts dating back to the Saladoid (500 B.C. – A.D. 500), Suazoid (A.D. 1000 – 1400) and Cayoid (A.D. 1450 – 1700) periods, such as traditional burial pots/urns and frog-shaped pottery, have been discovered throughout St. Vincent, often during construction activities. Two large stones with numerous depressions, believed to be petroglyphs, have also been reportedly discovered in the Sandy Bay area.

None of the heritage resources falls within the right of way of the proposed bridges.

5.12 Economic Activities and Resources

St. Vincent and the Grenadines rely on agriculture, forestry, fisheries, and tourism as its main sources of income. In 2014, the services sector, which includes tourism, contributed 75.2 percent of the gross domestic product (GDP), followed by the industrial sector at 17.1 percent, and the agriculture sector at 7.8 percent.

Historically, bananas were the single most important agricultural commodity, but its contribution to GDP, foreign exchange earnings, and employment has significantly declined. Other crops, such as plantains, root crops (dasheen, eddoes, yams, sweet potatoes, ginger, arrowroot, cassava, tannia, carrots, and peanuts), fruits and vegetables have partially filled the void left by the decline of the banana industry and now play a more significant role in agricultural GDP. The Government's implementation of structural reforms to diversify crops has played a role in the success of the other crops sub-sector, which accounted for approximately 69.5 percent of the overall agricultural GDP in 2020.

The tourism sector has shown significant dynamism between 2015 and 2019, with an average annual growth rate of 18.2 percent, as per data from the Eastern Caribbean Central Bank (ECCB). Cruise ship passengers have been a prominent driver of this growth, with a rising flow of international visitors due to an increase in the number of cruise passengers received. From 2011 to 2019, the number of cruise ship vessels received by St. Vincent and the Grenadines more than doubled from 124 to 260.

District 3 of Agricultural Region 8, where the communities are located, has approximately 1,600 registered farmers. The 2022 Revised Livelihood Baseline Assessment (LBA) Reports reveal that Fancy has around 160 registered farmers, while Owia has a similar number at 163. In both Fancy and Owia, slightly more men are involved in farming, with 52.5 percent in Fancy and 58.9 percent in Owia. The area has 2 or 3 farming cooperatives, but farmer participation rates in these groups are low. Most farmers are engaged in small-scale farming on land holdings not exceeding 1 hectare. The recent volcanic eruption has severely disrupted agricultural production in the area, and the recovery process has been exceedingly slow. The substantial volumes of ashfall, reaching as much as 2 feet in some places, created a “hard pan” that hinders water infiltration and brought crop cultivation to a halt. The Agricultural Extension and Advisory Services Department has reported that, as a result, about half of the registered farmers in the area are currently not actively involved in agricultural production.

Agricultural production took a big hit during the eruption of La Soufriere Volcano. While the local industry is recovering, farmers have reported that, except for plantain production, low prices have made it unprofitable to produce most crops at this time. Furthermore, the practice of some ‘traffickers’ (traders who export agricultural produce to Barbados and Trinidad and Tobago) of delaying payment for the commodities they received until they were sold places farmers and their families at a disadvantage.

High unemployment remains a persistent concern identified by residents as hindering the development of their communities. The high unemployment rate is compounded by the fact that the AOI experiences the highest level of poverty on the island per the 2008 Survey of Living Conditions/Household Budgetary Survey (SLC/HBS). This suggests that subsistence farming is common but not considered employment by the residents. According to the 2022 Revised LBA Report, using data collected during the 2019 LBA survey, over 50 percent of interviewed residents in Overland (51%), Owia (50%), and Sandy Bay (51%) reported being unemployed. Fancy had the lowest proportion of unemployed individuals at 36 percent. The employed population largely worked in crafts, trades, and elementary occupations as labourers, trades persons, housekeepers, mechanics, shopkeepers, domestic workers, tailors, and painters. Retired individuals were prevalent in Owia and Fancy. Other occupations included nurses, teachers, police officers, and public/civil servants.

Women were mainly represented in professional and associate professional roles, retirees, homemakers, and the unemployed segments of the population. The 2015 and 2017 Labour Force Surveys showed that 9.0 percent and 10.5 percent of the country’s working population were employed in the construction sector in 2015 and 2017, respectively, with the labour market divided along gender lines. Male workers dominated the sector despite the availability of technical and vocational training programmes that women can enter and a wider range of non-traditional occupations in the industry. However, the low participation of women in the sector continues to exist. Women

comprised about 2.5% and 1% of the workers employed in the industry in 2015 and 2017, respectively.

5.13 Road Network

The road network in St. Vincent and the Grenadines consists of 515 miles and is composed largely of minor roads which provide access to rural and agricultural areas and, to a lesser extent, secondary and major roads. Secondary roads provide access within residential neighbourhoods off major roads but do not carry large traffic volumes. St. Vincent's major roads carry large volumes of traffic and permit traffic flow through and between communities. The primary roads on the island of St. Vincent run mainly along the perimeter of the island, while secondary roads generally provide access inland. Despite the AOI being in a rural setting with agriculture as a prominent economic activity, the linear settlement pattern of the communities north of Rabacca makes the Windward and Ivy Joshua Highways the most vital roads, serving as the primary arterial routes.

5.13.1 Major Roads: Windward and Ivy Joshua Highway

The Windward Highway (or Ebenezer Highway) and the Ivy Josua Highway are two of the five major roads in St. Vincent's road network. The Windward Highway stretches along the island's eastern coast, beginning at Kingstown in the south and passing through Arnos Vale, Calliaqua, Peruvian Vale, Biabou, Georgetown, and terminating at Rabacca. This road is characterized by its winding nature, steep grades, and sharp turns. On the other hand, the Ivy Joshua Highway starts at Rabacca and follows the eastern coast northward, passing through Orange Hill, Magum, Overland, London, Sandy Bay, Point, Owia, and concluding at the village of Fancy. To residents in the AOI, the Windward Highway extends past Rabacca and terminates at Fancy.

The combined length of the Windward Highway and the Ivy Joshua Highway is approximately 34 miles. The road has a flexible pavement structure between the capital, Kingstown, and the village of Sandy Bay. Between Sandy Bay and Fancy, it becomes a rigid concrete pavement. Pavement markings on Windward Highway are intermittently present. The carriageway has a typical width of 18 feet to 21 feet. In 2009, as part of upgrades, the Windward Highway was widened to its present typical width of 16 feet to 23 feet, along with shoulders on both sides. Additionally, improvements were made to address sharp turns and steep grades along the highway. Recent repairs to the roads and drains have greatly improved the main road from Fancy to Owia, with good concrete and asphalt surfaces.

Alongside vehicle drivers and passengers, pedestrians and bicyclists also use the Ivy Joshua Highway. Residents reported that Sandy Bay has the highest number of bicycle users. The highway is also frequently used by children walking to and from primary schools in the AOI. With the relocation of the Sandy Bay Secondary School to Georgetown, secondary school students now rely on public buses to get to school, causing them to leave their communities earlier than before. The resulting weekday pedestrian activity usually starts as early as 7:00 a.m. in further north communities like Fancy, until 8:45 a.m. for school travel, and resumes at approximately 3:00 p.m. for the return journey. The afternoon school journey often overlaps with the pedestrian commute of workers, resulting in high pedestrian volumes until around 6:00 p.m. On weekends, pedestrian volumes on the roads are typically low. Outside of Kingstown, there are limited sidewalks or designated pedestrian paths along the public roads, which may pose challenges to pedestrians' safety and convenience.

5.13.2 Minor Roads

In the communities within the AOI, aside from the major highways, the transport infrastructure is poor. The 2022 Revised LBA Reports, conducted by the Caribbean Development Bank (CBA) for Sandy Bay, Fancy, Owia, and Overland, highlighted several issues with the subsidiary roads and drains. In Fancy, earthen roads were observed, and Overland was found to have no paved roads. Poor infrastructure, such as inadequate road surfaces and drains, was identified as a developmental challenge in Fancy and Owia, as reported by the residents during the assessment. While the Sandy Bay area is generally well-lit with streetlights installed throughout, some areas in Owia lack streetlights. Furthermore, drainage issues throughout Sandy Bay negatively impact some residents. Settlements and secondary roads built in the river bed make it difficult for water to drain properly during heavy rainfall, contributing to drainage problems.

The lack of proper road infrastructure has resulted in limited and irregular public transportation options for the communities in the area. While one converted truck/bus is used for transportation, donkeys are the primary mode of transportation in Overland. Fancy residents have also expressed concerns about inadequate and unscheduled public transportation to and from the community, highlighting it as one of the main challenges they face. The poor transport infrastructure poses significant challenges to the daily lives and mobility of residents in the AOI. Farmers reported that there was a need for better agricultural access to their mountainside farm plots.

5.13.3 Impact of 2021 Volcanic Eruption

The transportation sector has been significantly impacted by the La Soufrière volcanic eruption, constituting the most affected segment within the infrastructure sector. The total estimated cost of damage and loss to this sector amounts to XCD 74.4 million. The physical damage is approximately XCD 30 million, mainly attributed to partial repair and reconstruction (intermediate damage level) of roads and river crossing infrastructure, including bridges and fords. The remaining cost of XCD 44.4 million is associated with the losses incurred, encompassing changes in economic flows, ash removal, and cleaning activities. Cleaning and ash/debris removal from the road network of mainland St. Vincent represented one of the most relevant losses within the transport sector due to the disaster. Additionally, the ashfall resulted in the partial closure of the road network in St. Vincent, causing traffic interruptions, delays, and shortages of inputs to other economic sectors, among other repercussions. The impact of the volcano eruption on transportation has created significant challenges and disruptions to the movement of goods, people, and services across the affected areas.

According to the most recent “River Crossing and Housing Infrastructure Detailed Damage Assessment” report of 2021 by the Ministry of Transport and Works, the Georgetown district was the most affected area in the country. The volcanic eruption caused damage to 31 river crossing infrastructure elements in Georgetown, with 71 percent having low damage and the remaining 29 percent experiencing damage requiring partial repairs. In Sandy Bay, 15 river crossing structures were damaged, with 10 ten structures having minor damage and the other 5 requiring partial repairs due to bridge rail destruction and impact damage from river debris. The damage in the Georgetown district amounts to an estimated XCD 16.430 million, while in Sandy Bay, the cost of damage has been assessed at XCD 11.965 million. In Georgetown, the Agrika bridge inlet was blocked with debris and boulders, leading to complete channel filling, river overtopping, and damage to homes along the riverbanks. The Karo and Cayo River bridges suffered rail damage, blockage of inlets, and complete destruction of remnants of wing walls due to the eruption. The Owia Big River Bridge sustained heavy damage to the deck’s carriageway section, with bridge rail destruction caused by boulders and debris impact during high flow events after the eruption. New boulders have been deposited upstream, and the bridge inlet was fully blocked, allowing the river to flow over the bridge deck as a ford in its current condition.

In Sandy Bay, the section of the Ivy Joshua Highway that crosses the red hazard zone needed repairs for drains and retaining walls, estimated at a cost of XCD 215,000. London streets also required repairs to drains, roadway, and retaining walls, at an approximate cost of XCD 295,100. The Magum Road from the highway upward experienced damage to its roadway, estimated at XCD 178,500, while the upper Waterloo Road near Sheep Pen and other roads also require repairs to drain, roadway, and retaining walls, amounting to approximately XCD 335,000.

5.14 Health Facilities and Conditions

There are four public health clinics located in Sandy Bay, Owia and Fancy. These clinics offer free health care services to residents during the weekdays, ranging from pharmacy services, anti- and post-natal services for pregnant mothers and women who have given birth, chronic disease clinic (Diabetes and Hypertension), daily dressings of wounds, family planning clinic, doctor's clinic and child health clinic. The health clinics also handle emergencies within the communities. The closest hospital is the Modern Medical Diagnostic Complex in Georgetown, some 12.4 miles (or 43 minutes) from Fancy, the furthest Over-the-River community from the facility.

5.15 Educational Infrastructure and Access to Education

The education status of a population is an important indicator of the social and economic development of an area. St. Vincent and the Grenadines has achieved universal access to education, which ensures that all persons of primary and secondary school age have equal educational opportunities, regardless of social class, gender, ethnicity or physical or mental disability.

Early Childhood Education is recognized as an important foundation of the formal educational process, and as such, the Ministry of Education has made strides in realizing universal access to early childhood education for all children. There are five early childhood centres/pre-schools in the AOIs – the Sandy Pearl Anglican Pre-school, Sandy Bay Gospel Pre-school, and the Precious Jewel Pre-school in Sandy Bay; the early childhood centre associated with the Owia Government Primary School; and the privately owned pre-school in Fancy. Enrolment in the early childhood education centres for District 1 in 2020/2021 totalled 102 students and averaged 20 students per school, while enrolment in District 2 totalled 263 students and averaged 38 students per school.

There are four primary schools in the AOI: the Tourama/Overland Primary Government School, Sandy Bay Primary Government School, Owia Primary Government School, and Fancy Primary Government School. There were 480 students in the 3 schools in District 1 in 2020/2021, and 100 students in the Tourama/Overland Government Primary School. The Tourama/Overland Primary Government School is located within 500m of the London Bridge.

Sandy Bay Government Secondary School, which was once in the community of Sandy Bay, was relocated to Georgetown, some 6.8 miles or 19 minutes from its original location in Sandy Bay. The total enrolment for Sandy Bay in 2020/2021 was 230 students (127 males; 103 females).

TABLE 5-7: SCHOOLS IN DISTRICT 1 AND 2

NO	EARLY CHILDHOOD CENTRES	NO	PRIMARY LEVEL	NO	SECONDARY LEVEL
District 1					
1	Fancy Preschool	1	Fancy Government	1	Sandy Bay Secondary
2	Precious Jewels Preschool	2	Owia Government		
3	Sandy Pearl Preschool	3	Sandy Bay Government		
4	Sandy Bay Gospel Chapel Preschool				
5	Owia Government Early Childhood Centre				
District 2					
6	Sunshine Preschool	4	Tourama Government	2	Georgetown Secondary
7	Stars Preschool	5	Langley Park Government		
8	Georgetown Methodist Preschool	6	Georgetown Government		
9	Grace and Truth Preschool	7	Dickson Methodist		
10	Berean Baptist	8	Pamelus Burke Primary		
11	Byesave Toddlers & Preschool				
12	Langley Park Government Early Childhood Centre		School for Children with Special Needs, Georgetown		

5.16 Water Supply and Sanitation

The water catchments for the area are in Sion Hill (Sandy Bay), Owia, and Fancy, which are supplied mainly from surface water sources (rivers) situated on the slopes of the La Soufriere Volcano. The Central Water and Sewerage Authority (CWSA) established an express line from Georgetown to support water delivery for that side of the island. The main river in Fancy is used as a water catchment to supply water to the community, while further downstream, it is used as a recreational park, for relaxation, washing clothes and river fishing.

5.17 Access to Energy

5.17.1 Main Source of Lighting

According to the 2012 Population and Housing Census, electricity from the public supply was the main source of lighting used in St. Vincent and the Grenadines. Nationally, 88.9 percent of households relied on public electricity, showing an increase from 79.8 percent in 2001. Similarly, in Sandy Bay and Georgetown, 81.9 percent and 82.8 percent of households used electricity as their primary light source, respectively. The Census also indicated that there was a geographical disparity in electricity availability across the country, as areas farther away from the capital city tended to have lower access to public electricity. Thus, the concentration of households without electricity increased by an average of 0.3 percent for every mile travelled from Kingstown with the Sandy Bay Division having the least concentration of public electricity as a source of lighting (82.5%). The more recent 2022 Revised Livelihood Baseline Assessment Reports confirmed electricity as the primary source of lighting in the AOI. The reports also highlight variability in electricity provision between communities within the Sandy Bay Census Division. In Sandy Bay, the majority of residents reported being connected to the electricity grid, with approximately 96 percent of households having access to electricity. On the other hand, residents in Fancy stated that their electricity supply is inconsistent and unreliable, posing a significant developmental challenge for the community.

5.17.2 Main Source of Fuel

In 2012, LPG or cooking gas was the predominant source of cooking fuel across the country. Nationally, 93.8 percent of households used LPG as their main cooking fuel. In Georgetown, 91.7 percent of households utilized cooking gas, while in Sandy Bay, the figure was slightly lower at 88.2 percent. Wood usage for cooking was minimal in both Sandy Bay and Georgetown, with less than 5 percent of households relying on it (4.8% in each area). However, despite the low usage of wood, households in Sandy Bay and Georgetown administrative areas were more than twice as likely to use wood as a cooking fuel compared to households nationally.

5.18 Sports and Recreational Facilities

Sports play a significant role in recreational activities within the AOI, with cricket, netball, basketball, and football being prominent sports. Several parks, playing fields, and hard courts are available in the area for hosting sporting events. In London, the Pamenos Ballantyne Playing Field /London Playing Field and the Owia Salt Pond Recreational Park in Owia serve as green spaces and playing fields. Additionally, there are multipurpose spaces with concrete surfaces used for netball and basketball in Overland (Overland Hard Court), Fancy (Fancy Hard Court), and Owia (as part of the recreational park). The Overland Hard Court, though smaller, is accessible to the community besides its primary use by the school. Fancy Hard Court is the only public recreational space in the community. Consequently, the community has identified a lack of sufficient recreational facilities as a developmental challenge.

In addition to organized sporting facilities, communities in the AOI also utilize natural resources for recreation. In Fancy, the lower part of the main river serves as a recreational park and a place for relaxation. In Owia, the Owia Salt Pond is a natural ocean-fed swimming pool formed where lava flows were cooled by the waters after the La Soufriere Volcano eruption. It has been designated as a national park for over twelve years. Owia is also home to various other natural and cultural heritage sites, such as trails, a waterfall, rivers, beaches, and farmlands, providing additional opportunities for recreational activities and exploring the local environment and cultural heritage.

5.19 Safety and Security

Stakeholder discussions suggest crime and violence is an emerging concern for the Over-the-River communities. Some residents interviewed to date describe the area as calm and peaceful. However, there were reports of the use of drugs and alcohol among youths, particularly in known areas. Unemployment is reportedly high, especially among youths as well.

6 NATURAL ENVIRONMENT - ANALYSIS OF PROJECT IMPACTS AND RECOMMENDATION OF MITIGATION MEASURES

Potential impacts on the Social Environment are discussed in Chapter 7. This chapter describes potential environmental impacts (natural environment), both adverse and beneficial, that may arise from the works described in Chapter 2. For adverse impacts, the nature of the impact is described, appropriate mitigation measures are recommended, and the impact is classified post-mitigation. All classifications are done on a systematic basis. Cumulative impacts are also classified.

6.1 Impact Assessment Process

On this assignment, the assessment of environmental impacts was undertaken in four (4) steps:

v. Identification of Potential Impacts;
vi. Establishing the Significance of these Impacts;
vii. Classification of the Impacts; and
viii. Assessment of Cumulative Impacts.

6.1.1 Identification of Potential Impacts

The potential impacts of this project (beneficial as well as adverse) were identified after a review of general guidance documents, and Ecoengineering's experience on similar bridge construction projects from 1991 to present (see Appendix D).

6.1.2 Establishing the Significance of Impacts

Potential impacts of the construction of the new bridge at London were assessed on a qualitative basis. Different degrees of sophistication were used in assessing different impacts. Where mitigation measures were recommended, the assessment assumes that these measures will be implemented.

6.1.3 Classification of Impacts

After the significance of each impact was assessed (see Section 5.1.2), each potential impact was classified on a structured basis. The classification method (see Appendix E) was based on three criteria: Extent (see Figure 6-1), Intensity, and Duration. Based on this, impacts were classified as Low, Moderate or High. Where adverse impacts were considered to be insignificant, no classification was applied. For this project, impacts are classified pre and post mitigation. The classification of each impact is indicated in the respective subsection of this chapter, and a summary of the Post-Mitigation Classification is provided in Table 6-1.

TABLE 6-1:SUMMARY OF POST MITIGATION CLASSIFICATION

IMPACT	EXTENT	INTENSITY	DURATION	CLASSIFICATION
CONSTRUCTION PHASE				
Physical Environment				
Erosion	On site	Minor	Short Term	Low
Slope Instability	On site	Minor	Short term	Low
Impaired Water Quality (Siltation)	On-site	Minor	Short Term	Low
Impaired Water Quality (Hydrocarbon Spills and Leaks)	On-site	Minor	Short Term	Low
Impaired Water Quality (Concrete Washings)	On-site	Very Small	Short Term	Low
Impaired Water Quality (Improper Disposal of Toilet Waste)	This Impact will be Eliminated			
Impaired Air Quality (Dust)	Regional	Minor	Short Term	Moderate
Impaired Air Quality (Exhaust Emissions)	Regional	Very Small	Short Term	Low
Noise and Vibration	Localized	Very Small	Short Term	Low
Flooding	On-site	Very Small	Short Term	Low
Soil Contamination	On-site	Very Small	Short Term	Low
Groundwater Contamination	Regional	Very Small	Long Term	Moderate
Improper Disposal of Solid Waste (Cleared Vegetation)	This Impact will be Eliminated			
Improper Disposal of Solid Waste (Demolition Rubble)	This Impact will be Eliminated			
Improper Disposal of Solid Waste (Other Construction Waste)	This Impact will be Eliminated			

IMPACT	EXTENT	INTENSITY	DURATION	CLASSIFICATION
Artificial Lighting	On-site	Very Small	Short Term	Low
Biological Environment				
Loss of Vegetated Areas	On-site	Very Small	Medium Term	Low
Disturbance to Wildlife	Localized	Very Small	Medium Term	Low
Impacts to Nearshore Marine Ecosystems	Localized	Very Small	Short Term	Low
Maintenance Phase				
Physical Environment				
Impaired Water Quality (Siltation)	Localized	Very Small	Medium Term	Low
Impaired Water Quality (Hydrocarbon Spills and Leaks)	Localized	Very Small	Medium Term	Low
Impaired Air Quality (Dust)	Localized	Very Small	Medium Term	Low
Impaired Air Quality (Exhaust Emissions)	On-site	Very Small	Medium Term	Low
Noise	On-site	Minor	Medium Term	Low
Improper Disposal of Silt/Debris	This Impact will be Eliminated			
Maintenance Phase				
Biological Environment				
Disturbance to Wildlife	On-site	Very Small	Medium Term	Low

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FIGURE 6-1: EXTENTS USED IN IMPACT CLASSIFICATION

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6.1.4 Cumulative Impacts

A simple definition of cumulative impact (Canter, 1996) is as follows:

"The impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable actions."

Ongoing and proposed projects which may give rise to cumulative impacts with the construction of the new bridge at London include bridges at Noel and Overland, the Sandy Bay Defense Project and the North Windward Water Supply Project.

The reconstruction of the God Save the Queen Bridge situated along the Northern Windward Highway, between the Overland and Noel project sites began on October 1st, 2023. The contract period for the construction of the new reinforced concrete bridge is 18 months. Construction is therefore likely to be completed before work on the London Bridge commences and as such is not expected to contribute a cumulative impact.

6.1.4.1 Bridges at Noel and Overland

It should be noted that though design consultancy for the construction of new bridges at Noel (Site 2) and Overland (Site 3) is also ongoing, it is unlikely that construction of either of these two bridges will be undertaken simultaneously with the works at London, and therefore is not expected to contribute to cumulative impacts on the physical and biological environment. However, the proposed construction of these two bridges may give rise to cumulative impacts on certain aspects of the social environment.

6.1.4.2 Sandy Bay Sea Defense Project

Seven hundred and fifty metres (750 m) of coastal protection is proposed at Sandy Bay, approximately 1 km north of the London site. These works are being undertaken in 3 segments. Work started on 2 segments in August 2023. The contract period for completion of these 2 segments is 18 months. It is anticipated that the contract for the final segment will be awarded in the 1st quarter of 2024. The contact period for this segment will also be 18 months.

6.1.4.3 North Windward Water Supply Project.

This project involves the development of a water supply system using groundwater source at Overland to replace the existing systems at Sandy Bay and Owia, the improvement of water purification on the Perseverance water supply system, and the improvement of the existing Fancy water supply system. It is currently in the consultancy/design phase.

6.2 Anticipated Project Benefits

The proposed development of the new bridge at London, if implemented successfully, will bring long-term benefits to the residents of the Over-the-River communities. The development of new bridge infrastructure will improve community safety, maintain traditional land use, reduce the risk of isolation for residents, and prevent disruptions to their daily lives of residents.

This means that restrictions on people's movement during intense rainfall and storm events, when flooding and the flow of lahars usually occurred would no longer be a disruptive factor. Residents can travel to work and school and access resources and services within and outside the beneficial communities, like health care, education, public administrative services, etc. The bridge will facilitate farmers and fisherfolk access to markets to sell their products and allow them to maintain/increase their income level and connection with outside farmers and fishers. Arrowroot farmers in Owia and Sandy Bay will be able to transport their harvested rhizomes to the newly constructed factory in Orange Hill once it has been completed. The bridge could also facilitate better disaster response.

6.3 Potential Impacts - Construction Phase

Potential adverse impacts on the natural environment that may arise during the works described in Chapter 2 are discussed under the following headings:

- Impacts on the Physical Environment; and
- Impacts on the Biological Environment.

For each potential impact, the nature of the concern is described, mitigation measures are recommended and pre and post mitigation classifications are provided where appropriate.

6.3.1 Impacts on the Physical Environment

Potential adverse impacts related to the physical environment during the construction of the new bridge at London include the following:

- Erosion;
- Slope Instability;
- Impaired Water Quality,
  - Siltation,
  - Hydrocarbon Spills and Leaks,
  - Concrete Washings, and
  - Improper Disposal of Toilet Waste;
- Impaired Air Quality,
  - Dust, and
  - Exhaust Emissions;
- Noise and Vibration;
- Flooding;
- Soil Contamination;
- Groundwater Contamination,
- Improper Disposal of Solid Waste
  - Cleared Vegetation,
  - Demolition Rubble;
  - Other Construction Solid Waste; and
- Artificial Lighting.

6.3.1.1 Erosion

6.3.1.1.1 Nature of Concern

The project site is naturally prone to erosion due to fast flowing flood waters resulting from storm events. Additionally, lahar flows following another volcanic eruption can generate sufficient energy to erode river banks. This can occur at any time during and following construction of the bridge.

Clearing vegetation along the banks of the Agrika River will be required to facilitate the construction of the new bridge at London. Cleared areas can become prone to erosion on a temporary basis. The potential for such erosion depends on characteristics of the soil, length and steepness of slopes, wind, rainfall and the presence of canopy and vegetative cover.

In-channel erosion can also occur when the riverbed and banks are excavated to install the bridge abutments; especially if water is allowed to flow over the excavations. The intensity of this erosion will depend on the type of soil which forms the river channel (rocky channels are less prone to erosion than sandy or clayey channels), and the flow velocity across the excavation. It is expected that cofferdams will be used to create a dry working area.

In addition, stockpiles of excavated material or construction aggregate stored on-site may be susceptible to wind erosion and can be washed away during storm events if not covered or protected and result in siltation in the rivers and nearshore marine areas.

6.3.1.1.2 Unmitigated Impact

On this project it is expected that cofferdams will be installed during construction to create dry working areas, therefore, the occurrence of in-channel erosion is unlikely.

Nonetheless, open stockpiles of excavated material or construction aggregate can be washed away during storm events and erosion arising from the removal of vegetation may occur. Though small areas are expected to be cleared of vegetation during site preparation, the primary soil type found at the project site is Volcanic Ash Soil, which is unconsolidated, course, porous, fertile and is highly susceptible to erosion. Therefore, unmitigated, this impact is classified as follows:

Extent	Intensity	Duration	Classification
On site	Medium	Medium term	Moderate

6.3.1.1.3 Mitigation Measures

In addition to the use of cofferdams to create dry working areas and the installation of scour protection upstream and downstream of the new bridge, the following measures can be implemented to reduce erosion:

- To the extent practical, conduct major earthworks during the dry season;
- Maintain natural vegetation to the extent practical. Only clear areas that are needed for construction or stockpiling;
- Re-surface roadway and re-vegetate cleared areas as early as practical;
- Keep temporarily stored stockpiles of construction aggregate a safe distance from watercourses and ensure that they are confined (using straw bales, wooden cribs etc.); and

These mitigation measures if implemented are expected to reduce the intensity of erosion resulting from site preparation and bridge construction, and the classification is as follows:

Extent	Intensity	Duration	Classification
On site	Minor	Short Term	Low

6.3.1.1.4 Cumulative Impact

None of the projects identified in Section 6.1.4 has the potential to increase erosion at the project site, therefore, no cumulative impact is expected.

6.3.1.2 Slope Instability

6.3.1.2.1 Nature of Concern

Slope instability leading to landslides and slumping is a major problem in St. Vincent as a result of the steep topography, common occurrence of unconsolidated pyroclastic rocks, volcanic activity and heavy rainfall events.

On this project, landslip potential of the banks of the Agrika River will increase from the clearing of vegetation. In addition, slope failures can occur if slopes are cut too steep or if the sideslopes of trenches are not adequately shored. The likelihood of this impact will depend, to a large extent, on the geotechnical properties of the soil. Slope failures may result in siltation in the rivers and nearshore marine areas.

6.3.1.2.2 Unmitigated Impact

Slope instability is closely related to erosion. Given that the soil at the project site is highly susceptible to erosion, slope failures can occur during excavation works as described above. Slope failure does not always occur immediately when a slope is cut too steep. In some instances, the failure does not occur until sometime after construction. Therefore, this concern can persist beyond the construction phase and is classified as follows:

Extent	Intensity	Duration	Classification
On site	Medium	Medium term	Moderate

6.3.1.2.3 Mitigation Measures

In addition to the mitigation measures listed above for erosion (see Section 6.3.1.1.3), the following measure is also available to address instability concerns:

- Ensure that slopes are cut to a safe angle of repose based on soil strength as determined by geotechnical investigation and install shoring as necessary.

These mitigation measures if implemented are expected to reduce the intensity of unstable slopes resulting from site preparation and bridge construction, and the classification is as follows:

Extent	Intensity	Duration	Classification
On site	Minor	Short term	Low

6.3.1.2.4 Cumulative Impact

None of the projects identified in Section 6.1.4 has potential to increase slope instability at the project site therefore, no cumulative impact is expected.

6.3.1.3 Impaired Water Quality

During site preparation and bridge construction, impairment of water quality within the Agrika River and subsequently, the nearshore marine area can arise from the following:

- Siltation;
- Hydrocarbon Spills and Leaks;
- Concrete Washings; and
- Improper Disposal of Toilet Waste.

6.3.1.3.1 Siltation

6.3.1.3.1.1 Nature of Concern

Siltation is directly related to erosion and slope instability. During periods of heavy rainfall, eroded material, temporarily stored excavated material and construction aggregate from the project site can be washed into the Agrika River and the nearshore environment. The impairment of water quality as a result of siltation, can affect the physical characteristics of the water, such as colour and turbidity. In addition, turbid waters can affect free-swimming organisms by impeding visibility and clogging of gills.

6.3.1.3.1.2 Unmitigated Impact

Given that the project site is situated just upstream of the outfall of the Agrika River, silt will be transported into the nearshore marine area, once there is sufficient flow in the river. Such instances will result in the impairment of water quality within the river as well as within the nearshore marine area, thereby impacting riverine organisms as well as marine organisms. Therefore, this impact can be classified as follows:

Extent	Intensity	Duration	Classification
Localized	Medium	Medium Term	Moderate

6.3.1.3.1.3 Mitigation Measures

Mitigation Measures available to address erosion and slope instability (see Sections 6.3.1.1.3 and 6.3.1.2.3 respectively), are also considered applicable to this section. Additionally, silt barriers can be installed downstream of the work area (to the extent practical) to limit the introduction of silt into the nearshore marine area.

These mitigation measures, if implemented, are expected to reduce the extent and intensity of siltation resulting from site preparation and bridge construction, and the classification is:

Extent	Intensity	Duration	Classification
On-site	Minor	Short Term	Low

6.3.1.3.1.4 Cumulative Impacts

It is possible that the impact of siltation may be cumulative. The release of silt into the nearshore marine area can arise from the Sandy Bay Sea Defense Project if work coincides with the bridge construction at London. However, the cumulative construction impact will last only as long as the construction phase. Therefore, the classification is as follows:

Extent	Intensity	Duration	Classification
Localized	Medium	Short Term	Moderate

6.3.1.3.2 Hydrocarbon Spills and Leaks

6.3.1.3.2.1 Nature of Concern

Fuel spills and leaks of hydrocarbons may occur whenever heavy equipment, machinery and vehicles are used during construction activities, as well as from on-site storage of fuels and refueling. A more intense impact can arise in the unlikely event that a fuel tank ruptures. Spilled or leaked fuels and lubricants can be washed, via surface run-off, into the rivers and eventually transported into the nearshore marine area. High concentrations of hydrocarbons can be detrimental to aquatic plants and animals.

6.3.1.3.2.2 Unmitigated Impact

It is unlikely that large amounts of fuel will be stored on-site. Notwithstanding, if fuel is to be stored on site, the potential for impacts due to a release is dependent upon the amount of fuel stored on site, method of storage and the presence of spill response equipment and trained personnel.

Small leaks and spills may occur from the operation of equipment, heavy machinery and trucks. Due to the close proximity of the project site to the Agrika River outfall, any hydrocarbons washed or released into the river will be transported into the nearshore marine environment. Therefore, this impact is classified as

Extent	Intensity	Duration	Classification
Localized	Medium	Short Term	Moderate

6.3.1.3.2.3 Mitigation Measures

Mitigation measures that can be implemented to reduce the impact of hydrocarbon spills and leaks include the following:

- Prepare and implement a Spill Control Plan.
- Provide training in spill control procedures for relevant construction personnel and implement; and ensure that all resources are made available.
- Keep lube oil in sealed containers to minimize spills and leaks; store in bunded, covered area with impervious floor.
- Ensure vehicles and construction equipment/machinery are routinely serviced to prevent mechanical issues that can lead to spills and leaks;
- Designate a specific area located away from the river for storage of fuels and fuelling of vehicles and equipment; such areas should be bunded and paved.
- Use appropriate pumps, hoses and nozzles for refuelling and place disconnected hoses in containers after refuelling to prevent spills;
- Keep spill kits with absorbent pads on site to respond to spills, rather than “washing down” the area; and
- For small spills, such as spills whilst refuelling vehicles, the contaminated material will be excavated and taken to an authorized landfill.

These mitigation measures if implemented are expected to reduce the extent and intensity of hydrocarbon spills and leaks resulting from site preparation and bridge construction, and the classification is:

Extent	Intensity	Duration	Classification
On-site	Minor	Short Term	Low

6.3.1.3.2.4 Cumulative Impact

In the event of a hydrocarbon spill during bridge construction works, there is the potential for hydrocarbons to be transported into the nearshore marine environment. This impact may be cumulative in the event that hydrocarbon spills and leaks occur during works on the Sandy Bay Sea Defense Project and the construction of the other two bridges. However, the cumulative construction impact will last only as long as the construction phase. Therefore, the classification is as follows:

Extent	Intensity	Duration	Classification
Localized	Medium	Short Term	Moderate

6.3.1.3.3 Concrete Washings

6.3.1.3.3.1 Nature of Concern

This concern can arise from the improper disposal of concrete waste and from the washing of concrete residues from the chutes and drums of mixer trucks, construction tools and surfaces where concrete may have been mixed on-site. Concrete washings have a high pH value which can increase the alkalinity of river water and sea water, thus harming aquatic/marine plants and animals.

6.3.1.3.3.2 Unmitigated Impact

Water quality impacts associated with concrete washings may arise from casting works required for the installation of bridge abutments and other concrete works. Like silt and hydrocarbons, any concrete washings entering the Agrika River can be transported into the nearshore marine area. However, this concern is limited to the construction phase. As such, unmitigated, this impact is classified as follows:

Extent	Intensity	Duration	Classification
Localized	Medium	Short Term	Moderate

6.3.1.3.3.3Mitigation Measures

Mitigation Measures to reduce the likelihood of concrete washings being introduced into the marine environment include the following:

- Prohibit the discharge of concrete washings directly into the environment;

- Establish a well-defined earthen pit on the site into which concrete washings will be poured. This pit should be lined with plastic to avoid soil and groundwater contamination. After evaporation of the water, the hardened material should be removed and disposed at an approved landfill; and

- All tools and equipment that come into contact with concrete must also be washed such that the wash water flows into the pit, or they must be washed in a designated area where the wash water can similarly be allowed to evaporate, and the hardened material sent for disposal at an approved landfill.

These mitigation measures, if implemented, are expected to reduce the extent and intensity of this impact resulting from site preparation and bridge construction, and the classification is:

Extent	Intensity	Duration	Classification
On-site	Very Small	Short Term	Low

6.3.1.3.3.4 Cumulative Impact

None of the projects identified in Section 6.1.4 will involve concrete works. Therefore, no cumulative impact is expected.

6.3.1.3.4 Improper Disposal of Toilet Waste

This impact can arise if proper toilet facilities are not provided for workers during the construction phase. Faecal contamination of river/ sea water can result in injury to aquatic/marine life and sickness to persons who may be exposed to such contaminants. However, it is common practice on construction projects in the West Indies to provide portable toilets at work sites. As long as these units are routinely removed from site for emptying and cleaning and the faecal matter is disposed of at an approved sewage treatment facility, this concern would be effectively eliminated.

6.3.1.4 Impaired Air Quality

Air Quality concerns during the construction of the new bridge at London primarily relate to the following:

- Dust; and
- Exhaust Emissions.

6.3.1.4.1 Dust

6.3.1.4.1.1 Nature of Concern

Potential sources of dust include general earthworks, movement of vehicles on unpaved surfaces, loose material from cleared areas and stockpiles. Dust is released into the air from the contact of tyres and working parts with the ground, particularly when vehicles travel over unpaved areas, thereby contributing to the 'kick-up' of dust into the air. Construction procedures such as earthworks can also release dust emissions into the air. In addition, dust may be blown from exposed stockpiles of dirt or construction aggregate stored on site during windy conditions or from trucks transporting granular material to or from the project site.

At high concentrations, dust can also affect plants by coating the leaves and impeding photosynthesis. The potential impact of dust on air quality is most pronounced in the dry season. In addition, dust is a nuisance, causing discomfort among persons affected and exacerbating illnesses such as asthma and bronchitis.

The dust concern will persist throughout the construction phase but will subside following road surface reinstatement and revegetation of cleared and exposed areas.

6.3.1.4.1.2 Unmitigated Impact

Ambient air quality monitoring results (see Section 4.2.8.2) reflect dusty conditions at the project site. During the construction phase, the concern of dust at the project site will be exacerbated. Earthworks such as clearing of vegetation and excavation of trenches are expected to result in the "kick-up" of dust into the atmosphere and will expose bare soils to wind. In addition, the dust concern will extend beyond the project site as dust will be generated from trucks hauling construction aggregate from quarries (within the "Regional" geographic area shown in Figure 6-1) to the project site.

As such, unmitigated, this impact is classified as follows:

Extent	Intensity	Duration	Classification
Regional	Medium	Short Term	Moderate

6.3.1.4.1.3Mitigation Measures

Mitigation Measures available to reduce the concerns related to dust emissions include:

- To the extent practical, clear only areas needed for construction, which would reduce the size of exposed areas from which dust can be released;
- Reinstate road surface or re-vegetate cleared areas as soon as practical;
- Minimize the size of stockpiles; cover smaller stockpiles or store fine aggregate material in bins or silos, to prevent exposure to wind;
- Optimize truck loads to reduce trips in and out of the site, which would reduce dust emissions from granular material;
- Implement traffic speed regulations within the construction zone, which will reduce the strength of winds created from the movement of vehicles, therefore reducing the release of dust into the air;
- Cover all transport vehicles (with tarpaulins etc.) moving granular materials to and from the site to prevent material from the load being emitted into the air as dust; and
- Implement dust control measures at sources, including frequently wetting and/or the application of dust palliatives to bare surfaces and access ways, thereby limiting opportunities for the formation of atmospheric dust.

These mitigation measures if implemented are expected to reduce the intensity of this impact resulting from site preparation and bridge construction, and the classification is:

Extent	Intensity	Duration	Classification
Regional	Minor	Short Term	Moderate

6.3.1.4.1.4 Cumulative Impact

The kick-up of dust from trucks transporting construction aggregate along the Windward Highway for the construction of the bridge at London as well as for use on the other projects identified in Section 6.1.4 will create a cumulative impact. Therefore, the classification is as follows:

Extent	Intensity	Duration	Classification
Regional	Medium	Short Term	Moderate

6.3.1.4.2 Exhaust Emissions

6.3.1.4.2.1 Nature of Concern

Exhaust emissions will be released from the operation of equipment, machinery and vehicles during construction activities at the project site as well as from trucks transporting construction materials along the haul route. The engines of vehicles, machinery and powered equipment emit carbon monoxide, carbon dioxide, sulphur dioxide, nitrogen oxides, volatile organic compounds (VOCs) and soot (dust), all of which are harmful to people, animals and plants at sufficiently high concentrations.

Project-related exhaust emissions will stop when construction is completed.

6.3.1.4.2.2 Unmitigated Impact

Although a relatively large fleet of construction vehicles is required for construction of the new bridge, exhaust emissions from the operation of heavy machinery and the passage of trucks are expected to be a low-level concern. The windy conditions experienced at the project site will enhance dispersion of exhaust emissions thereby allowing air pollutants to dissipate to very low concentrations in a relatively small distance from source. As such, unmitigated, this impact is classified ad follows:

Extent	Intensity	Duration	Classification
Regional	Minor	Short Term	Low

6.3.1.4.2.3 Mitigation Measures

Mitigation measures available to minimize the release of exhaust emissions include the following:

- Properly service all construction equipment and machinery and transport vehicles to ensure that there are no visible exhaust emissions;

- Remove defective vehicles from fleet until they are repaired;
- Optimize trips for bringing material and/or transporting waste from the site by ensuring that the use of part-filled trucks is minimized (to the extent practical); and
- Turn off all engines from vehicles and equipment when not in use to reduce exhaust emissions into the atmosphere.

These mitigation measures if implemented are expected to reduce the intensity of this impact resulting from site preparation and bridge construction, and the classification is:

Extent	Intensity	Duration	Classification
Regional	Very Small	Short Term	Low

6.3.1.4.2.4 Cumulative Impact

This impact may be cumulative with other projects if construction works are being conducted simultaneously. In such an event, combustion gases will be emitted from exhausts of heavy machinery and equipment being operated at the other project sites. In addition, exhaust emissions will also be generated from trucks transporting construction aggregate along the Windward Highway for use in bridge construction as well as for use on the other projects identified in Section 6.1.4 will create a cumulative impact. Therefore, the classification is as follows:

Extent	Intensity	Duration	Classification
Regional	Minor	Short Term	Low

6.3.1.5 Noise and Vibration

6.3.1.5.1 Nature of Concern

Noise during the construction of the new bridge will be generated from the operation and movement of construction vehicles, machinery and equipment. Noise will be emitted from their engines, exhaust systems, horns, alarms and other operational functions and vibration will be generated as they move and work. Noise levels emitted by equipment will vary depending on factors such as the type of equipment, the model, the operation being performed, the condition of the equipment and the time for which the equipment is operated. It should be noted that the movement of heavy machinery can also cause vibration. Such vibration can cause damage to nearby residential homes and structures.

Noise and vibration can affect terrestrial animals causing them to relocate out of the area during noisy activities. However, they may return when high-noise activities cease. Noise also affects people living or working in the general project area during the day and the effect is especially significant to persons living within the area of interest.

6.3.1.5.2 Unmitigated Impact

Noise and vibration generated during site preparation and construction will be temporary, lasting only for a relatively short period. However, the results of noise monitoring conducted at the nearest receptor to the project site reflected noisy baseline conditions (see Section 4.2.9.2). Therefore, amplified noise levels arising from construction activities may have significant effects on the functioning of nearby residents and social groups. It should be noted that there are residential homes located approximately 5m to 20 m away from the project site at London. As such, noise and vibration emitted during bridge construction would be a disturbance to nearby residents.

Unmitigated, this impact of Noise and Vibration is classified as follows:

Extent	Intensity	Duration	Classification
Localized	Minor	Short Term	Low

6.3.1.5.3 Mitigation Measures

On this project, vibration is an unavoidable impact for which the only measures available are the use of low-impact equipment or methods where practical and the relocation of residents/houses within the impact zone. However, mitigation measures available to minimize concerns related to noise include the following:

- Regularly inspect and maintain construction vehicles and equipment (including mufflers on the equipment) to ensure noise emission control systems are properly functioning;
- Schedule work, particularly noise-intense construction activities during the daytime hours (e.g.7 a.m.-7 p.m.) to the extent practical;
- Ensure that existing acoustic controls on all noise-generating equipment are functional;
- Encourage operators to turn off or throttle down equipment (such as excavators, loaders etc.) whenever they are not in use;
- Choose alternative, low-impact equipment or methods where practical;

- Inform residents and other sensitive receptors of proposed construction activities prior to the start of work; and

- Conduct a condition survey of nearby residential homes and provide a mechanism by which feedback can be received from affected residents so that steps can be taken to address noise and vibration complaints whenever possible.

These mitigation measures if implemented are expected to reduce the intensity of this impact resulting from site preparation and bridge construction, and the classification is:

Extent	Intensity	Duration	Classification
Localized	Very Small	Short Term	Low

6.3.1.5.4 Cumulative Impact

This impact of noise may be cumulative if works on the Sandy Bay Sea Defense Project and the Northern Windward Water Supply Project are being conducted simultaneously with bridge construction at London. In such an event, noise and vibration will arise from the operation of heavy machinery and equipment and the transport of construction equipment, aggregates and other materials along the Windward highway. Due to noise associated with transport, the extent of the impact is regional, however, the intensity is not considered to be significantly different from existing conditions. Therefore, the classification is as follows:

Extent	Intensity	Duration	Classification
Regional	Very Small	Short Term	Low

6.3.1.6 Flooding

6.3.1.6.1 Nature of Concern

During bridge construction, the flow within the Agrika River may have to be temporarily diverted or controlled using cofferdams to create a dry working area. If temporary works are not adequately designed and effectively implemented, flooding can occur. In addition, it should be noted that the project site is prone to flooding during the wet season. Therefore, heavy rainfall during bridge construction works can exacerbate flooding.

6.3.1.6.2 Unmitigated Impact

The potential for flooding will largely depend on if bridge construction extends into the rainy season and the design and implementation of cofferdams. If cofferdams are unable to facilitate large volumes of fast flowing water, there may be severe flooding of the project

site and surrounding areas. Such flooding has the potential to affect areas beyond the immediate project site.

It must be noted that there are residential homes located approximately 20 m away from the project site at London. As such, unmitigated, the impact of flooding is classified as follows:

Extent	Intensity	Duration	Classification
Localized	Major	Short Term	Moderate

6.3.1.6.3 Mitigation Measures

In addition to the mitigation measures listed below in Section 6.3.1.9.2.3 to address the improper disposal of demolition rubble, the following measures are also available to reduce/mitigate the flooding concern.

- To the extent practical, works associated with the construction of the new bridge at London should be conducted during the dry season.

- Construct cofferdams upstream and downstream to create a dry working area. and excavate a diversion to allow water to flow around the work area, or pump water from above the upstream cofferdam back into the channel downstream of the work area.

These mitigation measures if implemented are expected to reduce the extent and intensity of this impact resulting from site preparation and bridge construction, and the classification is:

Extent	Intensity	Duration	Classification
On-site	Very Small	Short Term	Low

6.3.1.6.4 Cumulative Impact

The obstruction of flow within the Agrika River or other rivers within the watershed is not likely to arise from works associated with the other projects identified in Section 6.1.4. Therefore, no cumulative impact is anticipated.

6.3.1.7 Soil Contamination

6.3.1.7.1 Nature of Concern

Exposure to contaminated soil can be injurious to plants, animals and human beings where the level of contamination is relatively high. As explained in Section 6.3.1.3.2.1, hydrocarbons may be released to the environment from leaks from vehicles and equipment, spills and leaks during filling of tanks and fueling or from the very unlikely event that a fuel tank ruptures.

Significant concrete works will be required for the construction of the bridge at London where both bridge beams and bridge deck are cast-in-situ. Therefore, the improper disposal of concrete washings can also result in soil contamination.

6.3.1.7.2 Unmitigated Impact

On this project, the potential for soil contamination will be limited to the project site and laydown areas. Furthermore, soil contamination impacts are relevant to the construction phase and are not expected to have significant impacts on the functioning or sustainability of specific ecosystems, services or resources. As such, the unmitigated impact is classified as:

Extent	Intensity	Duration	Classification
On-site	Minor	Short Term	Low

6.3.1.7.3 Mitigation Measures

Given that soil contamination can arise from the release of hydrocarbons and concrete, the management options for hydrocarbon spills and leaks (see Section 6.3.1.3.2.3) and concrete washings (see Section 6.3.1.3.3.3) are also applicable here.

These mitigation measures if implemented are expected to reduce the intensity of this impact resulting from site preparation and bridge construction, and the classification is:

Extent	Intensity	Duration	Classification
On-site	Very Small	Short Term	Low

6.3.1.7.4 Cumulative Impact

Given that the potential for soil contamination will be limited to the project site and laydown areas, no cumulative impact is anticipated.

6.3.1.8 Groundwater Contamination

6.3.1.8.1 Nature of Concern

During bridge construction, various activities can contribute to groundwater contamination. Depending on the permeability of the soil and the hydraulic gradient in the subsoil, hydrocarbons can travel significant distances into the groundwater. In addition, hydrocarbon spills and leaks and the improper disposal of toilet waste (see Sections 6.3.1.3.2 and 6.3.1.3.4) have the ability to percolate the soil and contaminate groundwater.

6.3.1.8.2 Unmitigated Impact

As stated in Section 4.2.5 above, the project site is located within the island's main aquifer unit. Therefore, there is a high potential for groundwater contamination due to hydrocarbon spills and leaks and sewage. Considering that refuelling of vehicles and equipment may take place on-site, the classification of this unmitigated impact is:

Extent	Intensity	Duration	Classification
Regional	Minor	Long Term	High

6.3.1.8.3 Mitigation Measures

Given that groundwater contamination can arise from the release of hydrocarbons and the improper disposal of toilet waste, the mitigation measures listed for hydrocarbon spills and leaks (see Section 6.3.1.3.2.3) and improper disposal of toilet waste (see Section 6.3.1.3.4) are also applicable here. These mitigation measures if implemented are expected to reduce the intensity of this impact resulting from bridge construction, and the classification is:

Extent	Intensity	Duration	Classification
Regional	Very Small	Long Term	Moderate

6.3.1.8.4 Cumulative Impact

On all Construction projects, there is potential for hydrocarbon spills and leaks. However, the likelihood of large spills at the other project sites is low even with respect to the water supply project which will involve accessing the groundwater. As such, the classification for the cumulative impact of groundwater contamination is as follows:

Extent	Intensity	Duration	Classification
Regional	Minor	Long Term	High

6.3.1.9 Improper Disposal of Solid Waste

This impact is three-fold and relates to the improper disposal of:

- Cleared Vegetation,
- Demolition Rubble and
- Other Construction Solid Waste.

6.3.1.9.1 Cleared Vegetation

6.3.1.9.1.1 Nature of Concern

The removal of small areas of vegetation along the banks of the Agrika River will be required to facilitate the construction of the bridge at London. In addition, clearing may also be required for the establishment of laydown areas for the storage of construction, machinery/equipment and materials.

6.3.1.9.1.2 Unmitigated Impact

Improper disposal of felled vegetation at the project site can directly cause blockage of the waterway. This can obstruct the flow of water in the river towards its outfall creating a flooding concern in upstream areas and for nearby residents (see Section 6.3.1.6.1). Unmitigated, the impact of Improper disposal of cleared vegetation is classified as follows:

Extent	Intensity	Duration	Classification
On-site	Very Small	Short Term	Low

6.3.1.9.1.3 Mitigation Measures

The following mitigation measures are available to address the concern of improper disposal of felled vegetation:

- Clear only areas required for construction. Maintain natural vegetative cover as far as practical in areas adjacent to the construction work;
- Ensure cleared vegetation is stored a safe distance away from the water course;
- Cleared vegetation should be sent to approved compost site / landfill; and
- Avoid the burning felled vegetation on site, as burning will produce unacceptable air emissions and also poses the risk of bush/forest fires.

The proper application of these mitigation measures will eliminate this impact.

6.3.1.9.1.4 Cumulative Impact

Because this impact will be effectively eliminated by the application of mitigation measures, the question of a cumulative impact does not arise.

6.3.1.9.2 Demolition Rubble

6.3.1.9.2.1 Nature of Concern

Temporarily stored or improperly disposed concrete slabs and pieces of steel at the project site can directly cause blockage of the waterways. This can obstruct the flow of water in the river towards its outfall creating a flooding concern for nearby residents and in upstream areas (see Section 6.3.1.6.1).

In addition, demolition rubble that is stored on site for prolonged periods is a public safety concern. Members of the general public are particularly vulnerable to injury from these hazards because, unlike workers on the site, members of the public are not trained in construction safety, nor are they provided with the site specific personal protective equipment.

6.3.1.9.2.2 Unmitigated Impact

The construction of the new bridge at London may require the demolition of the existing box culvert and concrete channel sidewalls. The demolition of these structures will generate a substantial amount of rubble, comprising of concrete slabs and steel. As such, unmitigated, this impact is classified as follows:

Extent	Intensity	Duration	Classification
On-site	Medium	Short Term	Low

6.3.1.9.2.3 Mitigation Measures

Mitigation Measures available to address improper disposal of demolition rubble include the following:

- A Waste Management Plan (WMP) should be developed and implemented, specific to the construction of the new bridge at London;
- Temporarily store demolition rubble in a suitable area, away from water courses, until it can be transported to another site for beneficial reuse or an approved landfill for disposal; and

- Remove demolition rubble from site as soon as practical.

The proper application of these mitigation measures will eliminate this impact.

6.3.1.9.2.4 Cumulative Impact

Because this impact will be effectively eliminated by the application of mitigation measures, the question of a cumulative impact does not arise.

6.3.1.9.3 Other Construction Solid Waste

6.3.1.9.3.1 Nature of Concern

In addition to felled vegetation and demolition rubble, solid waste generated during the construction phase will include construction waste such as cement bags, plastics and wood used from packaging as well as off cuts of steel etc. and domestic waste such as beverage containers, snack wrappers, food containers used by workers. The improper disposal of these wastes is a cause for concern because they can possibly be blown or washed off site. Solid waste transported into the sea can impact sea turtles if the plastics migrate into their foraging grounds.

6.3.1.9.3.2 Unmitigated Impact

Unmitigated, solid waste generated at the project site has the potential to be blown or washed into the nearby water course and eventually transported into the nearshore marine area. Considering the volume of waste that may be generated, this impact can have significant effects on specific ecosystems, services or resources. Therefore, unmitigated, the impact of improper solid waste disposal is classified as:

Extent	Intensity	Duration	Classification
Localized	Medium	Short Term	Moderate

6.3.1.9.3.3 Mitigation Measures

Mitigation Measures available to address improper disposal of solid waste include the following:

- Collect all domestic garbage in secure receptacles for disposal at an approved landfill. No garbage should be left open or accessible to animals or allowed to litter the ground or water courses;

- Prohibit burning of waste on site (packaging materials, construction scraps etc.), as burning will produce unacceptable air emissions and pose the risk of fires.

The proper application of these mitigation measures will eliminate this impact.

6.3.1.9.3.4 Cumulative Impact

Because this impact will be effectively eliminated by the application of mitigation measures, the question of a cumulative impact does not arise.

6.3.1.10 Artificial Lighting

6.3.1.10.1 Nature of Concern

Artificial lighting at night can be a nuisance to nearby residents (potentially affecting sleep, watching the television, etc.). Artificial lighting can also adversely affect roosting, foraging and resting of birds and other animals, particularly the activities of nocturnal birds and animals.

6.3.1.10.2 Unmitigated Impact

During field reconnaissance, only one streetlight was noted at the London site. Additional lighting will be required during the construction phase for security purposes, night work, or both. Unmitigated, the impact of artificial lighting is classified as:

Extent	Intensity	Duration	Classification
On-site	Very Small	Short Term	Low

6.3.1.10.3 Mitigation Measures

Mitigation Measures available to address artificial light concerns include the following:

- Nighttime lighting should only be used to the extent that is required; and
- Use shielded and downward focused lighting fixtures.

However, although the effects will be reduced through these measures, the overall classification does not change.

Extent	Intensity	Duration	Classification
On-site	Very Small	Short Term	Low

6.3.1.10.4 Cumulative Impact

It is unlikely that the other projects identified in Section 6.1.4 will have a cumulative artificial light impact at the London project site.

6.3.2 Impacts on the Biological Environment

Potential adverse impacts related to the biological environment during the construction of the new bridge at London include the following:

- Loss of Vegetated Areas;
- Disturbance to Wildlife; and
- Impacts to Nearshore Marine Ecosystems.

6.3.2.1 Loss of Vegetated Areas

6.3.2.1.1 Nature of Concern

Clearing of small areas of vegetation along the banks of the Agrika River will be required to facilitate the construction of the new bridge at London. Furthermore, clearing may also be required for the establishment of laydown areas for the storage of construction, machinery/equipment and materials.

6.3.2.1.2 Unmitigated Impact

The proposed works at London will result in the unavoidable loss of relatively small areas of vegetation. Though several floral species including Coconut, Breadfruit and Almond were noted in the vicinity of the project site, vegetation in the area where the new bridge is proposed was sparse and consisted of a few shrubs (Wild Ochro) as the area was recently backfilled following the construction of concrete channel sidewalls. Nonetheless, clearing of fruit trees may be required for the establishment of laydown areas. Following the construction of the new bridge and re-surfacing of the roadway, it is expected that

cleared areas will be re-vegetated where practical. Therefore, unmitigated, this impact is classified as follows:

Extent	Intensity	Duration	Classification
On-site	Very Small	Medium Term	Low

6.3.2.1.3 Mitigation Measures

Mitigation measures available to address concerns relating to loss of vegetation include the following:

- Clear only areas required for construction. Maintain natural vegetative cover as far as practical in areas adjacent to the construction works; and
- Re-vegetate temporarily cleared areas as early as practical.

However, although the impact will be reduced through these measures, the overall classification does not change.

Extent	Intensity	Duration	Classification
On-site	Very Small	Medium Term	Low

6.3.2.1.4 Cumulative Impact

Clearing of vegetation at the project site is not expected to arise from works associated with the other projects identified in Section 6.1.4. Therefore, no cumulative impact is anticipated.

6.3.2.2 Disturbance to Wildlife

6.3.2.2.1 Nature of Concern

As stated in Section 6.3.1.5.1, noise and vibration will be generated during construction activities particularly from the use of construction equipment and heavy machinery. Such noise and vibration can potentially affect animals in areas adjacent to where work is being carried out. Anthropogenic sounds can disturb animals and cause them to migrate to less noisy areas.

It should be noted that noise from construction activities may be loud enough to carry beyond the boundaries of the relevant proposed location of work. However, this impact

is expected to be temporary and transitionary, lasting only as long as these works last. After the construction phase, it is anticipated that wildlife will return to the site.

In addition to noise and vibration, artificial lighting can affect roosting, foraging and resting of birds and other animals, particularly the activities of nocturnal birds and animals (see Section 6.3.1.10.1).

6.3.2.2.2 Unmitigated Impact

Although animals may migrate to less noisy areas which they can inhabit, this impact may persist beyond the construction phase, as noise will be generated by periodic maintenance works conducted throughout the operational life of the bridge and due to the possible addition of streetlights along the roadway and bridge. As noted in Section 4.3.4, the only endemic species recorded at the project site during field reconnaissance was the St. Vincent Anole (*Anolis trinitatus*). However, there is potential for other endemic reptiles and mammals to inhabit nearby forested areas. Therefore, this impact is classified as:

Extent	Intensity	Duration	Classification
Localized	Minor	Medium Term	Moderate

6.3.2.2.3 Mitigation Measures

Given that disturbance to wildlife can occur from noise and vibration and artificial lighting the mitigation measures listed to address such concerns (see Sections 6.3.1.5.3 and 6.3.1.10.3) are also applicable here. These mitigation measures if implemented are expected to reduce intensity of this impact and therefore, the classification is as follows:

Extent	Intensity	Duration	Classification
Localized	Very Small	Medium Term	Low

6.3.2.2.4 Cumulative Impact

This impact may be cumulative if noise intense works are being conducted simultaneously on the other projects. It is expected that earthworks associated with both the sea defence and water supply projects as well as the other bridge construction projects will generate significant noise. Therefore, the classification is as follows:

Extent	Intensity	Duration	Classification
Regional	Minor	Medium Term	Moderate

6.3.2.3 Impacts to Nearshore Marine Ecosystems

6.3.2.3.1 Nature of Concern

As stated in Chapter 2, the proposed new bridge along the Windward Highway at London will provide vehicular crossings over the Agrika River. Thus, throughout the construction phase of this project, there is potential for the release of silt (see Section 6.3.1.3.1), hydrocarbons (see Section 6.3.1.3.2), concrete washings (see Section 6.3.1.3.3), toilet waste (see Section 6.3.1.3.4) and solid waste (see Section 6.3.1.9.3) into the water course.

During the dry season, flow within the river is minimal, however, during heavy rainfall events in the wet season, large volumes of water torrent through the channel toward its outfall on the eastern coast of the island into the Atlantic Ocean.

Impairment of water quality of the nearshore marine area from siltation, hydrocarbons spills and leaks, concrete washings, toilet waste and solid waste can adversely affect seagrasses, benthic communities, marine turtles, and fishes as well as other marine fauna.

6.3.2.3.2 Unmitigated Impact

The outfall of the Agrika River is approximately 120 m east of the project site and as a result, any contaminants released into the river will be rapidly transported into the nearshore marine environment. It is uncertain whether any ecologically sensitive areas such as coral reefs or seagrass beds exist within the nearshore marine area adjacent to the project site, but it is still likely that commercially important fish species inhabit this area. In addition, due to the close proximity of popular turtle nesting sites there is also potential for the presence of sea turtles within this region. Therefore, unmitigated this impact is classified as follows:

Extent	Intensity	Duration	Classification
Localized	Medium	Short Term	Moderate

6.3.2.3.3 Mitigation Measures

Given that impacts to nearshore marine ecosystems can occur from the impairment of water quality by silt, hydrocarbons, concrete washings, improperly disposed toilet waste and solid waste, the mitigation measures listed to address/reduce these adverse impacts are also applicable here (see Sections 6.3.1.3.1.3, 6.3.1.3.2.3, 6.3.1.3.3.3, 6.3.1.3.4.3 and 6.3.1.9.3.3).

These mitigation measures if effectively implemented are expected to reduce the intensity of this impact on the nearshore marine ecosystems, and the classification is:

Extent	Intensity	Duration	Classification
Localized	Very Small	Short Term	Low

6.3.2.3.4 Cumulative Impact

There is potential for a release of silt and hydrocarbons during the construction of the other bridges, the Northen Water Supply Project and the Sandy Bay Sea Defence works. Transport of these contaminants into the nearshore marine environment can therefore be a cumulative impact. As such, the classification isas follows:

Extent	Intensity	Duration	Classification
Regional	Medium	Medium Term	High

6.4 Potential Impacts – Maintenance/Operation Phase

Subsequent to construction and commissioning of the new bridge at London, periodic maintenance, inclusive of desilting works; repairs to superstructure, bearings and expansion joints, substructure, scour protection and safety furniture; as well as painting and waterproofing and reinstatement of the wearing surface (see Section 2.1.3, above). Potential adverse impacts that may arise during the Maintenance/Operation Phase are discussed under the following headings:

- Impacts on the Physical Environment and
- Impacts on the Biological Environment

For each potential impact, the nature of the concern is described, mitigation measures are recommended and pre and post mitigation classifications are provided where appropriate.

6.4.1 Impacts on the Physical Environment

Potential impacts on the physical environment during maintenance and operation of the bridge include:

- Impaired Water Quality (Siltation)
- Impaired Water Quality (Hydrocarbon spills and leaks);
- Impaired Air Quality (Dust)
- Impaired Air Quality (Exhaust Emissions);
- Noise; and
- Disposal of Silt and Ash.

6.4.1.1 Impaired Water Quality (Siltation)

6.4.1.1.1 Nature of Concern

During desilting/river clearing works, there is potential for siltation within the watercourse as well as the nearshore marine area (see Section 6.3.1.3.1.1).

6.4.1.1.2 Unmitigated Impact

Although desilting will be done after significant storm events or lahar flows, it is likely that routine desilting will be undertaken during the dry season when flow within the river is usually minimal. As such, the intensity of this impact is not expected to be significant.

However, since the new bridge will be situated just upstream of the outfall of the Agrika River, there is potential for silt to be transported into the nearshore marine area. Therefore, this impact can be classified as follows:

Extent	Intensity	Duration	Classification
Localized	Very Small	Medium Term	Low

6.4.1.1.3 Mitigation Measures

The following mitigation measures are available to reduce siltation:

- Install silt barriers downstream of the bridge during maintenance works to limit the introduction of silt into the nearshore marine area.
- Avoid temporary placement of excavated silt in close proximity to the banks of the channel, from where they can be washed into the watercourse.

However, although the impact will be reduced through these measures, the overall classification does not change.

Extent	Intensity	Duration	Classification
Localized	Very Small	Medium Term	Low

6.4.1.1.4 Cumulative Impact

Siltation is not expected to arise from any other activities at the bridge location, therefore, no cumulative impact is anticipated.

6.4.1.2 Impaired Water Quality (Hydrocarbon Spills and Leaks)

6.4.1.2.1 Nature of Concern

During desilting/river clearing works, the use of heavy machinery will be required. Therefore, there is potential for hydrocarbon spills as described in Section 6.3.1.3.2.1.

6.4.1.2.2 Unmitigated Impact

The potential of a large spill occurring is small and it is likely that routine desilting will be undertaken during the dry season when flow within the river is usually minimal. As such, the intensity of this impact is not expected to be significant. However, since the new bridge will be situated just upstream of the outfall of the Agrika River, in the event of a

spill there is potential for hydrocarbons to be transported into the nearshore marine area. Therefore, unmitigated this impact is classified as follows:

Extent	Intensity	Duration	Classification
Localized	Very Small	Medium Term	Low

6.4.1.2.3 Mitigation Measures

The following mitigation measures are available to reduce this impact:

- Ensure vehicles and construction equipment/machinery are routinely serviced to prevent mechanical issues that can lead to spills and leaks;
- Designate a specific area located away from the river for fuelling of vehicles and equipment;
- Use appropriate pumps, hoses and nozzles for refuelling and place disconnected hoses in containers after refuelling to prevent spills;
- Keep spill kits with absorbent pads on site to respond to spills, rather than “washing down” the area; and
- For small spills, such as spills whilst refuelling vehicles, the contaminated material will be excavated and taken to an authorized landfill.

However, although the impact will be reduced through these measures, the overall classification does not change.

Extent	Intensity	Duration	Classification
Localized	Very Small	Medium Term	Low

6.4.1.2.4 Cumulative Impact

Hydrocarbon spills are not expected to arise from any other activities at the bridge location, therefore, no cumulative impact is anticipated.

6.4.1.3 Impaired Air Quality (Dust)

6.4.1.3.1 Nature of Concern

The nature of the dust concern during the maintenance phase is the same as described in Section 6.3.1.4.1.1.

6.4.1.3.2 Unmitigated Impact

Ambient air quality monitoring results (see Section 4.2.8.2) reflect dusty conditions at the project site. During periodic desilting/ river clearing works, the concern of dust will be exacerbated, but will only persist until the maintenance work is complete. Therefore, unmitigated this impact is classified as follows:

Extent	Intensity	Duration	Classification
Localized	Minor	Medium Term	Moderate

6.4.1.3.3 Mitigation Measures

The mitigation measures listed in Sections 6.3.1.4.1.3 for dust are also applicable here. These mitigation measures, if implemented, are expected to reduce the intensity of the dust impact and as such is classified as follows:

Extent	Intensity	Duration	Classification
Localized	Very Small	Medium Term	Low

6.4.1.3.4 Cumulative Impact

Dust is not expected to arise from any other activities at the bridge location, therefore, no cumulative impact is anticipated.

6.4.1.4 Impaired Air Quality (Exhaust Emissions)

6.4.1.4.1 Nature of Concern

The nature of this concern is the same as described in Sections 6.3.1.4.2.1.

6.4.1.4.2 Unmitigated Impact

Desilting/river clearing nor repair works will not require a large fleet of heavy machinery and vehicles as the construction phase. In addition, windy conditions experienced at the project site will enhance dispersion of exhaust emissions thereby allowing air pollutants to dissipate to very low concentrations in a relatively small distance from source. Therefore, unmitigated, this impact is classified as follows:

Extent	Intensity	Duration	Classification
Localized	Very Small	Medium Term	Low

6.4.1.4.3 Mitigation Measures

The mitigation measures listed in Sections 6.3.1.4.2.3 for exhaust emissions are also applicable here. However, although the extent of the impact will be reduced through these measures, the overall classification does not change.

Extent	Intensity	Duration	Classification
On-site	Very Small	Medium Term	Low

6.4.1.4.4 Cumulative Impact

Exhaust emissions are not expected to arise from any other activities at the bridge location, therefore, no cumulative impact is anticipated.

6.4.1.5 Noise

6.4.1.5.1 Nature of Concern

The use of heavy machinery will be required for desilting/ river clearing works and maintenance activities such as milling and reinstatement of the wearing surface. Therefore, there is potential for noise as described in Section 6.3.1.5.

6.4.1.5.2 Unmitigated Impact

Desilting/river clearing nor maintenance repairs will not require a large fleet of heavy machinery and vehicles as the construction phase. Therefore, unmitigated, the impact of noise is classified as:

Extent	Intensity	Duration	Classification
Localized	Minor	Medium Term	Low

6.4.1.5.3 Mitigation Measures

The mitigation measures listed in Section 6.3.1.5.3 are also applicable here. However, although the intensity of the impact will be reduced through these measures, the overall classification does not change.

Extent	Intensity	Duration	Classification
Localized	Very Small	Medium Term	Low

6.4.1.5.4 Cumulative Impact

Noise is not expected to arise from any other activities at the bridge location, therefore, no cumulative impact is anticipated.

6.4.1.6 Improper Disposal of Silt/ Debris

6.4.1.6.1 Nature of Concern

This concern relates to surplus sediment and debris excavated from the channel at the bridge opening to ensure free passage of flow towards the river outfall. Excavated material temporarily stored close to the riverbank can be washed back into the channel during periods of rainfall. In addition, ill-considered dumping of the excavated material can impair beneficial use of the receiving environment.

6.4.1.6.2 Unmitigated Impact

It is expected that excavated material will be transported to an appropriate disposal site. Therefore, unmitigated, this impact is classified as:

Extent	Intensity	Duration	Classification
On-site	Very Small	Medium Term	Low

6.4.1.6.3 Mitigation Measures

Mitigation measures available to address this concern include the following:

- Avoid temporary placement of silt or soil in close proximity to the banks of the watercourse, where it can be washed into the watercourse.
- Beneficially reuse of soil at other locations, whenever practical.
- Where beneficial reuse is not possible, select disposal sites where the silt or soil can be adequately contained.

The proper application of these mitigation measures will eliminate this impact.

6.4.1.6.4 Cumulative Impact

Because this impact will be effectively eliminated by the application of mitigation measures, the question of a cumulative impact does not arise.

6.4.2 Impacts on the Biological Environment

The potential impacts on the biological environment that may arise during the maintenance works include:

- Disturbance to Terrestrial Wildlife, and
- Impacts on Nearshore Ecosystems.

6.4.2.1 Disturbance to Terrestrial Wildlife

6.4.2.1.1 Nature of Concern

The nature of this concern is the same as explained in Section 6.3.2.2.1.

6.4.2.1.2 Unmitigated Impact

It is expected that animals close to the site will move away from noise generated by the operation of machinery during maintenance works and may return to the area once the noise stops. However, maintenance works will be conducted throughout the operational life of the bridge. Therefore, unmitigated, this impact is classified as:

Extent	Intensity	Duration	Classification
On-site	Very Small	Medium Term	Low

6.4.2.1.3 Mitigation Measures

Given that disturbance to wildlife during the maintenance phase can occur from noise and vibration, the management options listed to address noise in Sections 6.3.1.5.3 are also applicable here.

However, although the intensity of the noise may be somewhat reduced through these measures it will not be completely illuminated and as such, the overall classification does not change.

Extent	Intensity	Duration	Classification
On-site	Very Small	Medium Term	Low

6.4.2.1.4 Cumulative Impact

Noise is not expected to arise from any other activities at the bridge location, therefore, Disturbance to Wildlife is not anticipated to be cumulative.

6.4.2.1 Impacts to Nearshore Marine Ecosystems

6.4.2.1.1 Nature of Concern

Clearing of the river channel and maintenance work have the potential the release of silt (see Section 6.4.1.1), hydrocarbons (see Section 6.4.1.2) and improper disposal of silt and debris (see Section 6.4.1.6) into the water course.

6.4.2.1.2 Unmitigated Impact

Impairment of water quality of the nearshore marine area from siltation, hydrocarbons spills and leaks and disposal of silt and debris can adversely affect seagrasses, benthic communities, marine turtles, and fishes as well as other marine fauna.

Unmitigated this impact is classified as follows:

Extent	Intensity	Duration	Classification
Localized	Minor	Medium Term	Moderate

6.4.2.1.3 Mitigation Measures

Given that impacts to nearshore marine ecosystems can occur from the impairment of water quality by silt, hydrocarbons and debris, the mitigation measures listed in Sections 6.4.1.1.3, 6.4.1.2.3 and 6.4.1.6.3 are also applicable here. These are expected to eliminate the impact on the nearshore environment as the potential contaminants will not travel off-site.

6.4.2.1.4 Cumulative Impact

Because this impact will be effectively eliminated by the application of mitigation measures, the question of a cumulative impact does not arise.

7 SOCIAL ENVIRONMENT - ANALYSIS OF PROJECT IMPACTS AND RECOMMENDATION OF MITIGATION MEASURES

This Chapter focuses on the analysis of the potential impacts on stakeholders in the AOI communities. Stakeholder concerns are discussed in Chapter 8.

7.1 Impact Analysis Approach

This section sets out the potential impacts on people (the social receptors) and the social environment by the construction of the proposed London Bridge. It assesses the impacts expected during the different project phases – Pre-construction, Construction, and Maintenance phases and identifies measures to avoid, prevent, and mitigate negative impacts. Where appropriate, the analysis identifies the measures to be applied to optimize positive impacts.

The impact analysis was guided by the following:

- World Bank Environmental and Social Framework
- VEEP Environmental and Social Framework
- World Bank/VEEP Environmental and Social Commitment Plan (ESCP)
- VEEP Labour Management Plan
- VEEP Stakeholder Environmental Plan
- VEEP Grievance Redress Mechanism
- VEEP Resettlement Policy
- Sample VEEP ESMPs.

The approach to social impact analysis involves the following:

- Identification of social AOI;
- Identification of project actions which could lead to changes in the human environment;
- Identification of critical social factors;
- Identification of social impacts; and
- Evaluation of the magnitude of the impacts.

7.1.1 Social Area of Influence

Regarding the London Bridge subproject, the social AOI consists of the community of Sandy Bay, within which the infrastructure will be constructed and the neighbouring communities that routinely use the bridge. Table 7-1 identifies the communities in the AOI.

7.1.2 Identification of Subproject Actions

Based on the subproject description, several project actions have been identified with the potential to significantly modify the environment, thereby generating social impacts. These actions were presented for the Pre-construction, Construction, and Operation (maintenance) phases of the London Bridge subproject. Table 7-2 outlines project activities (Project Description) and the main project actions that can potentially change the human environment.

TABLE 7-1: THE AOI COMMUNITIES BY AREA OF INFLUENCE

AREA OF INFLUENCE	DEFINITION	COMMUNITIES
Direct impacts	a. Households, landowners, land users, institutions and livelihood, social and cultural activities which fall within or are close to the footprints of the London Bridge and its associated infrastructure (e.g., areas upstream and downstream of the bridge where the riverbank protection works will occur, the realigned road sections, etc.).	Sandy Bay, Overland
	b. Residents and communities that will routinely utilize the bridge.	Fancy, Owia, Sandy Bay, Overland
	c. Location for environmental resources – air, water, beachfront, noise and vibration, aesthetics, etc. likely to be affected	London, Noel, Tourama
	d. Activities not under the control of the Subproject but will be triggered by Subproject implementation (e.g., land acquisition and resettlement of residents).	Orange Hill
Indirect impacts	Two Census Divisions wherein the AOI communities are located: a. Sandy Bay Census Division, where most of the country's indigenous people reside. Fancy, Owia and Sandy Bay are in this Census Division. **b.** Georgetown Census Division. Overland and Orange Hill are in this Census Division.	Northeast communities

TABLE 7-2: KEY PROJECT ACTIVITIES AND ACTIONS

SUBPROJECT PHASE	PROJECT ACTIVITIES AS DESCRIBED IN THE PROJECT DESCRIPTION	IMPACTING ACTIONS
Pre-construction	➢ Community engagement activities ➢ Land acquisition and resettlement of all targeted individuals and households from the project site according to the Subproject Land Acquisition and Resettlement Plan.	➢ Interaction with London residents and the targeted households and individuals ➢ Acquiring land from property owners necessary for the construction of the London Bridge
Construction	*Site preparation* ➢ Demolition of the existing concrete retaining wall along the southern bank downstream of the existing crossing. ➢ Preparation of the ground by excavating to the required depth and grade.	➢ Recruiting construction workers ➢ Use of vehicles and heavy machinery ➢ Earthworks ➢ Constructing temporary alternative crossing ➢ Interaction with London residents and the targeted households and individuals ➢ Project worker activities and behaviours
	Construction of bridge abutments ➢ Upstream and downstream obstruction/alteration of the river. ➢ Transportation of reinforcing steel to the Subproject site. ➢ Cutting and bending of reinforced steel to size and shape, and placement in excavated area. ➢ On-site mixing of concrete or transportation of pre-mixed concrete to site. ➢ Pouring concrete into the excavation to create a base slab. ➢ Steel reinforcement upward extension to the top of the abutment ➢ Installation of formwork to the required dimensions and creation of weep holes. ➢ Pouring and densification of concrete into the formwork in layers. ➢ Curing of concrete to specified strength and removal of formwork.	➢ Recruiting construction workers ➢ Transportation and storage of construction equipment and materials (cement, pre-mixed concrete, reinforcing steel) ➢ Earthworks ➢ Use of vehicles and heavy machinery ➢ Setting up and removal of formwork ➢ Use of vibrators in the densification of concrete. ➢ Quality control measures ➢ Waste disposal measures ➢ Interaction with London and other AOI residents ➢ Project worker activities and behaviours

SUBPROJECT PHASE	PROJECT ACTIVITIES AS DESCRIBED IN THE PROJECT DESCRIPTION	IMPACTING ACTIONS
	➢ Backfilling of excavated space behind each abutment with soil or granular material. ➢ Using dump trucks to transport additional materials to the construction site.	
	Installation of beams and deck slab ➢ Creating the formwork for the beams and deck slab at an offsite location ➢ Transporting the formwork and reinforcing steel to the site on flatbed trucks ➢ Casting bridge beams in place (using concrete works as described for abutments) ➢ Curing of bridge beams. ➢ Installing deck slabs using similar methods	➢ Recruiting construction workers ➢ Transportation and storage of construction materials to the project site ➢ Earthworks ➢ Use of vehicles and heavy machinery ➢ Setting up and removal of formwork ➢ Use of vibrators in the densification of concrete. ➢ Quality control measures ➢ Waste disposal measures ➢ Interaction with London and other AOI residents ➢ Project worker activities and behaviours
	Scour protection and channel improvement works upstream and downstream of the bridge ➢ Installing reinforced concrete channel walls ➢ Using rock revetment ➢ Using masonry stone protection ➢ Installing of rip rap structures	➢ Recruiting construction workers ➢ Removal of vegetation and debris ➢ Transportation of rock, geotextile and other construction materials to the site (such as cement, pre-mixed concrete, aggregates etc.) ➢ Use and storage of local aggregates ➢ Earthworks ➢ Use of vehicles and heavy machinery. ➢ Setting up and removal of formwork ➢ Use of vibrators in the densification of concrete. ➢ Quality control measures ➢ Managing and disposal of project waste

SUBPROJECT PHASE	PROJECT ACTIVITIES AS DESCRIBED IN THE PROJECT DESCRIPTION	IMPACTING ACTIONS
		➢ Interaction with London and other AOI residents ➢ Project worker activities and behaviours
Operation/ Maintenance	*Undertaking maintenance activities to safeguard the structural integrity and safety of the bridge* a. Cleaning drainage system to remove leaves, debris, etc., every 3 to 6 months at minimum b. Inspecting and cleaning bridge sub-structure and super-structure every 2 years and seal any cracks encountered c. Repairing bearings as identified. d. Inspecting deck every 5 years and sealing any cracks identified e. Milling and replacing the wearing surface every 10 years f. Painting/waterproofing bridge every 5 years g. Inspecting expansion/movement joints every two years and repairing them as required h. Inspecting bridge abutment and pier foundation scour protection measures every 2 years and repairing as required i. Inspecting bridge safety features (reflectors, guard rails, warning signage, etc.) every 2 years and repairing as required *Undertaking emergency inspection and repairs to maintain the structural integrity and safety of the new London Bridge* a. Cleaning and clearing drainage system with heavy lahar flows b. Conducting an emergency inspection of the bridge and performing necessary repairs to bridge super-structure and sub-structure, river training structures after significant storm events and lahar flow	➢ Interacting with the communities regarding major maintenance activities. ➢ Project worker activities and behaviours

7.1.3 Identification of Social Factors and Impacts

Based on the characterization of the AOIs social environment and development issues, a list was developed of the area's social, cultural and economic features that are likely to change, positively or negatively, due to project actions (see Table 7-3).

For the sake of this impact assessment, a social impact is defined as a social and cultural change/effect (adverse or beneficial) or any social process on a social group or receptor invoked by the proposed London Bridge subproject that may alter the way residents live, work, play, relate to one another, their quality of life, organize to meet their needs, and generally how they cope as members of their community. Cultural impacts involve changes to people's norms, values, and beliefs, which guide and rationalize their perception of themselves, their community, and the AOI as a whole.

TABLE 7-3: SOCIAL CONDITIONS, IMPACT AREAS AND SOCIAL RECEPTORS

COMPONENT	FACTORS/ CONDITIONS	IMPACT AREAS	RECEPTORS
Social	Household resettlement	- Land procurement	Families and individuals residing in the right of way (ROW) of the proposed London Bridge.
	Health and safety	- Community health and safety	Individuals residing within a 500-metre radius of the construction site Roadside residents living along the AOI sections of the Windward Highway. Sensitive social receptors within 500 metres of the worksite in a downwind direction and roadside residents along the AOI Windward Highway sections. Sensitive social receptors include schools and residences close to the construction site. The Tourama/Overland Primary Government School is located within 500m of the London Bridge.
	Stakeholder engagement	- Community engagement and relations	AOI residents.

COMPONENT	FACTORS/ CONDITIONS	IMPACT AREAS	RECEPTORS
	Social inclusion	- Gender equality - Other vulnerable populations	Women, youths, older adults (the elderly), and poor households.
Economic	Labour, livelihoods and economic activities	- Local employment generation	AOI residents seeking employment and the unemployed.
		- Changes in family income	
Cultural	Daily activities	- Transport	Residents and visitors. Indigenous peoples.
		- Cultural heritage	

The key impact areas that are likely to be affected by the Subproject are the following:

- Land Procurement;
- Community Engagement and Relations;
- Local Employment and Livelihoods;
- Community Health and Safety;
- Transport and Travel;
- Gender Equality; and
- Cultural Heritage Resources.

7.1.4 Evaluation of Potential Impacts

The impact assessment considers people's analysis of their situation and their expressed perspectives on how the Subproject will likely affect their way of life and well-being. Stakeholders' viewpoints presented in Chapter 8 also inform the evaluation as well. It recognizes that the Subproject may affect some sub-populations differently depending on their age, gender, ability (disability), educational level, ethnicity, living conditions, or other factors which may affect the ability of people and groups to mobilize, participate in decisions important to them or influence decision-making. Such factors may also affect their ability to resist or adjust to changes or to take advantage of new opportunities which any change may offer.

Baseline social characteristics and conditions, along with the results of discussions with residents and other stakeholders, identified key areas of concern that are considered in the impact evaluation:

- The Windward Highway is the only arterial in and out of the AOI and can be described as the lifeline link between the communities and the rest of St. Vincent.

Any major decline in the quality, reliability, or availability of this road will significantly impact the social and economic viability of the AOI.

- There is residential squatting on the banks of several rivers in the AOI, which contributed to riverine flooding in Sandy Bay along the London River.

- Households along the London River were targeted for resettlement. While some families have already relocated, there were those who, for various reasons, were refusing to resettle to their homes in Orange Hill or were waiting for the houses allocated to them.

- Despite significant investment in housing, infrastructure, and services in the AOI after the eruption of La Soufriere and recent climate disasters, many residents still struggle to recover.

- Unemployment has increased and, with the exception of farming, few available livelihood opportunities are available, especially for young people. The volcanic eruption and COVID-19 pandemic have deepened the challenge.

- There are limited opportunities for youth development.

The evaluation used a qualitative system which recognizes the diverse circumstances among various population groups, which can often lead to distinct groups experiencing identical social impacts differently. The impact assessment considers the vulnerability of the AOI (to poverty, disasters, etc.) compared to the rest of the country and the vulnerability of local population subgroups within the area.

7.1.5 Impact Parameters

The social impacts covered three phases of the subproject – Pre-construction, Construction and Bridge Maintenance (operation). This rating system provides a structured method for rating the potential social impacts (before and after mitigation measures). Impacts were evaluated and rated on the basis of three parameters – nature (positive or negative, direct, indirect and cumulative) and intensity (very small, minor, medium, major, or extreme) of an impact, and the sensitivity of the receptor (low, medium and high) (see Table 7-4). Appendix E provides a complete description of the impact evaluation method.

TABLE 7-4: EVALUATION OF SOCIAL IMPACTS

Nature of the impacts				
Positive (+)	*Negative (-)*	*Direct*	*Indirect*	*Cumulative*
Impact Intensity (duration, extent and reversibility of an impact)				
Very small	*Minor*	*Medium*	*Major*	*Extreme*
Sensitivity of the social receptor				
Low	*Medium*	*High*		

The significance of the impacts (negligible, minor, moderate and major) was based on the sensitivity of the social receptor and the impact intensity (see Table 7-5). Table 7-6 describes the different impact significance categories.

TABLE 7-5: SIGNIFICANCE OF SOCIAL IMPACTS

IMPACT INTENSITY	SENSITIVITY OF THE AFFECTED RECEPTOR(S)		
	LOW SENSITIVITY	MEDIUM SENSITIVITY	HIGH SENSITIVITY
Very Small Impact	Negligible	Negligible	Negligible
Minor Impact	Negligible	Minor	Moderate
Medium Impact	Minor	Moderate	Major
Major Impact	Moderate	Major	Major
Extreme Impact	Major	Major	Major

TABLE 7-6: ASSESSMENT OF IMPACT SIGNIFICANCE ON AFFECTED SOCIAL RECEPTORS

IMPACT SIGNIFICANCE LEVEL	DESCRIPTION
Negligible Impact	Direct or indirect impacts practically do not change the social baseline conditions, local in extent and short term (temporary) in duration; impacts do not adversely affect the local community/Project area.
Minor Impact	Short-term direct and indirect changes caused by Subproject implementation, but with no long-term change or consequences to people's way of life and well-being. Affected receptors either easily adapt to changes or proceed with their 'normal life'.
Moderate Impact	Direct and indirect impacts on the living conditions and well-being of the local community (project area). Affected receptors may have some difficulties adjusting to changes brought about by the Subproject, and so some support is needed.
Major Impact	Widely spread direct and indirect impacts, which can only be mitigated after bridge construction. The affected receptors cannot adapt to changes or return to baseline conditions without significant investments (for instance, payment of compensation or relocation).

Mitigation measures were identified in cases where the impacts were rated as adverse and significant enough to require action to prevent or mitigate (reduce) their effects to an acceptable level. The impacts were reassessed using the same approach outlined before. A summary of the potential impacts is presented for each category.

7.2 Potential Impacts – Site Preparation and Construction

Potential impacts on the social environment are discussed under the following headings:

- Land procurement
- Community engagement and relations
- Local employment and livelihoods
- Community health and safety
- Transport and travel
- Gender equality
- Cultural heritage resources.

7.2.1 Land Procurement

7.2.1.1 Nature of Concern

Public infrastructure development initiatives, at times, may require the acquisition of land. Through the Land Acquisition Act of 1947 (Cap. 241), the Government has the authority to acquire any land for public use and to pay compensation for assets. According to the World Bank ESS5 (Land Acquisition, Restrictions on Land Use and Involuntary Resettlement), the act of repossessing State lands occupied by the households living in the bridge ROW should be considered as land acquisition. The costs associated with property acquisition are usually covered by the Government.

For the construction of the London Bridge and its approach, approximately three properties need to be acquired – one for the southern approach and two for the northern approach. The ongoing resettlement programme involves the relocation of families from the south flood zone of the London River to the newly constructed housing development in Orange Hill. The home in the south approach falls under this programme. However, it should be noted that while some households have already relocated or eagerly await their homes, there were families resisting the move. The household located on the river's south bank may fall in this category. During community interviews, a main reason cited for resistance was dissatisfaction with the small size of the new houses, which residents felt were not comparable to their current homes.

The relocation of the other two properties on the north side of the bridge ROW does not fall under the current programme, and, therefore, a new involuntary acquisition and resettlement process will be needed. As a subproject under the VEEP, the VEEP Resettlement Policy Framework (RPF) applies here. Therefore, as quoted in the Framework, '*Affected households will be eligible for compensation and rehabilitation assistance, irrespective of tenure status, social or economic standing and any such factors that discriminate against the achievement of the resettlement objectives. Lack of legal rights to lost assets or tenure status and social or economic status will not prohibit the affected households from entitlements to compensation and assistance.*'

7.2.1.2 Unmitigated Impact

The potential impacts associated with the involuntary acquisition and resettlement are:

- Displacement of the affected households from their homes, leading to the loss of homes and assets and the disruption of established routines, social networks, and community ties. Displaced households include any member of the household – men, women, children, older adults, persons with disabilities, and other vulnerable people.

- Loss of livelihoods resulting from the losing an important community shop where groceries and other items are sold.

- Inadequate compensation to the affected households, which they may not consider fair and adequate to rebuild their lives and reestablish themselves elsewhere.

- Anxiety and stress associated with the relocation process and disruption of their normal routines.

Unmitigated, the impact of the bridge construction at London on land acquisition and resettlement is classified as Major.

7.2.1.3 Mitigation Measures

The measures proposed to mitigate the land procurement impacts in accordance with the guiding principles of the VEEP RPF are:

- Develop and implement a Resettlement Action Plan;

- Complete the land acquisition and resettlement process prior to the start of land clearance;

- Fully engage the affected households throughout all stages of the land acquisition and resettlement process, from planning and implementation to operation, with affected parties having opportunities to participate in matters affecting their lives. Therefore, meetings should be held between the affected households and the Government with a view of reaching an agreement regarding land acquisition and resettlement arrangements, including the terms and conditions for resettlement and the roles and responsibilities of each party.

- Ensure that any compensation housing provided to the affected households is of equivalent or higher quality than their existing home and is provided within the AOI or environs.

- Provide relocation assistance suited to the needs of each group of displaced households and sufficient for them to improve or at least restore their standard of living at an alternative site. This assistance must take into consideration the needs of vulnerable household members, such as older adults, persons with acute health concerns and persons with disabilities.

- Provide compensation to business owners for the cost of reestablishing business activities at a different location, transferring and reinstalling business equipment, and for income lost during the transition period.

- Provide alternative targeted assistance for displaced, disadvantaged persons, renters and households without legally recognised claims living on properties.

- Establish the use of the subproject grievance redress mechanism, which is accessible to all, to address land procurement and resettlement issues in keeping with VEEP guidelines.

After mitigation, the residual impact on land acquisition and resettlement is rated as Moderate.

7.2.1.4 Cumulative Impact

Like the London Bridge subproject, given the close proximity of homes in the vicinity of the bridges and a lack of reserves for road improvement works, there is the possibility that land acquisition may be a requirement for the Noel and Overland subprojects as well. This provides an opportunity to acquire the necessary properties simultaneously.

7.2.2 Community Engagement and Relations

7.2.2.1 Nature of Concern

During the community consultation process, stakeholders have inquired about the timing of bridge construction, details about the subproject activities, and worker selection for employment opportunities generated by the subproject. Although residents welcome the introduction of a new London Bridge, the absence of consultation with community stakeholders regarding subproject activities, coupled with the potential impacts, may cause uncertainty and tension and foster resentment within the AOI communities toward the PIU, the agencies with responsibility for land acquisition and resettlement and the Construction Contractor.

7.2.2.2 Unmitigated Impact

Inadequate community engagement – Considering community concerns with previous public construction and other projects in the AOI, there is the possibility that similar issues may emerge and create tension and poor relations between the Construction Contractor and residents. Discord may result from inadequate communication and engagement of stakeholders, including limited information disclosure about the subproject and its progress, ineffective mechanisms for addressing residents' grievances or concerns regarding the project, and the inability to reach residents during emergency situations at the construction site.

Engaging the homeowners targeted for land acquisition and resettlement – The relocation of the affected homes is crucial to the bridge subproject. The Departments of Physical Planning and Housing will have to engage the affected householders as part of the land acquisition and resettlement process. It is natural for householders to draw on the experiences and concerns of the families who were resettled recently from the London riverbank. The process will involve meetings with affected homeowners who may feel uneasy and anxious due to the uncertainty of the situation. Their apprehension could be further exacerbated by insufficient information and the spread of misinformation and rumours about the process.

Social conflict – The influx of external workers, coupled with the absence of a mechanism that favours local worker recruitment, may be perceived as biased labour hiring practices by residents and has the potential to create tension between residents and the construction contractor.

Unmitigated, the impact of the bridge construction in London on community relations is classified as Moderate.

7.2.2.3 Mitigation Measures

The measures proposed to mitigate the community engagement and relations impacts are:

- Initiate consultations with all affected householders once the final design has been approved to discuss and reach an agreement on the land acquisition and resettlement plan. The consultations, which should take the form of focus group discussions, should take place in a public space, presenting information in a clear and simple format (whether conveyed orally, through presentations and/or in written form), ensuring easy interpretation and understanding by all participants. Participants should be supplied with an information sheet which they could take with them for further reference and clarity.

- Conduct any data-gathering exercise (census) as part of the land acquisition and resettlement process concurrently with the consultations to lessen the chance of stakeholder fatigue. It is crucial to discuss and address the concerns of women and vulnerable family members and incorporate their perspectives into the resettlement plan. This approach ensures a comprehensive and inclusive process that considers the diverse needs and considerations of all affected families and individuals involved.

- Recruit a Community Liaison Officer to engage stakeholders and facilitate communication with AOI communities during the construction phase. The Officer will also be responsible for finalising and implementing the subproject community engagement plan (see ESMP).

- Engage residents in discussions and reach an agreement on the scheduling of and conditions under which road upgrading works can be conducted that will ensure minimum disturbance to the daily lives of residents (e.g. scheduling of construction work (days and times), accessing private properties, addressing nuisances, health, safety, and other community concerns relating to bridge construction, etc.).

- Establish a subproject grievance redress mechanism to receive and promptly address all subproject-related complaints and grievances in an effort to minimise or eliminate negative impacts on the complainants. The mechanism, which should be appropriate, easily accessible, transparent, and unbiased, should be developed and implemented per the guidelines established under the VEEP grievance mechanism. Affected parties and residents must be able to submit their complaints through multiple means – either in person or anonymously by writing, verbally over the phone and social media, by fax, emails or any other media.

After mitigation, the residual impact on community relations is rated as Minor.

7.2.2.4 Cumulative Impact

If built concurrently, it is likely that three construction contractors will be selected to construct the bridges. Given the proximity of the three proposed bridges, stakeholder fatigue is a possibility if each Construction Contractor chooses to reach out to the same residents. On the other hand, inadequate information, communication, and consultation with residents will amplify concerns and the existing perception of biases in the community regarding the selection of persons for employment and other subproject opportunities. There should be coordination of stakeholder engagement activities among the Contractors and clear communication on how subproject opportunities will be distributed among residents.

7.2.3 Local Employment and Livelihoods

7.2.3.1 Nature of Concern

Construction projects may influence the income and livelihood conditions of the people who live in the area where the project will be implemented. Usually, construction contractors permanently engage skilled workers, with semi-skilled and unskilled positions reserved for persons living in the project area. However, there is a high demand for construction workers at present. Thus, contractors recruit workers from wherever they can. Unemployment in the subproject AOI is notably high even though St Vincent and the Grenadines is recovering from the 2021 volcanic eruptions and the COVID-19 pandemic.

7.2.3.2 Unmitigated Impact

The Subproject is anticipated to generate the majority of employment opportunities during the construction phase. About 41 jobs will be generated, covering various positions such as Construction Supervisor, Foreman, Health, Safety and Environment Officer, Quality Control Technician, Steel Fixer, Truck Driver, Checker, Mason, Carpenter, Welder, Electrician, Painter, Labourer, and Cleaner. Given the skill set of the AOI workers, they may seek employment in the semi-skilled and unskilled categories (see Table 7-7). Residents in the AOI have high expectations for local job opportunities on this and other construction subprojects but expressed doubts about having a fair chance of being recruited.

TABLE 7-7: TYPICAL JOBS GENERATED FOR THE CONSTRUCTION OF THE LONDON BRIDGE

NO.	JOB POSITION	PEAK MANPOWER QUANTITY	INHOUSE CONTRACTOR PERSONNEL	POTENTIAL FOR LOCAL EMPLOYMENT
1.	Supervisor	1	√	
2.	Foreman	3	√	
3.	Land Surveyor	1	√	
4.	Health, Safety and Environment Officer	2	√	
5.	Equipment Operator	4	√	
6.	Quality Control Technician	1	√	
7.	Carpenter	2	√	√
8.	Mason	2	√	√
9.	Steel Fixer	2	√	
10.	Welder	1	√	
11.	Painter	2	√	√
12.	Truck Driver	4	√	
13.	Checker	1		√
14.	Semi-Skilled Labourer	10		√
15.	Labourer	2		√
16.	Security Guard	2		√
17.	Cleaner	1		√
	Total	41		

While the Subproject can provide temporary relief to local persons seeking jobs, especially among the semi-skilled and unskilled worker population, the responsibility for recruiting the construction workforce lies with the construction contractor, who has no obligation to recruit local workers. With the ongoing construction boom in Saint Vincent, which is fuelled by the reconstruction efforts in the aftermath of La Soufriere's eruption, it is common for construction contractors to bring in an almost full workforce from locations outside of where the infrastructure works are taking place. Nevertheless, considering the high unemployment rates in the AOI, it will be crucial for the Subproject to maximize local employment.

Unmitigated, the impact of the bridge construction at London on local employment and livelihoods is classified as Major.

7.2.3.3 Mitigation Measures

To maximize the employment of local people in the AOI on the Subproject:

- Include clauses in the construction contractor's contract for:
    - Prioritizing the employment of local people, especially in semi-skilled and unskilled occupations and giving equal opportunity for employment to both local women and men. Establishing fair and transparent labour hiring practices, in collaboration with local leadership, that are transparent, made public, and non-discriminatory of all categories of workers regardless of gender, age, disability (ability) or any other characteristic, is essential for fostering an inclusive and equitable workforce.
    - Advertising the subproject employment opportunities throughout the AOI, ensuring that residents are fully aware of the available positions. The communication needs of the different social groups (women, youth, persons with disabilities, etc.) should be incorporated into the advertisement of employment opportunities.
- Establish a short-term training programme in the AOI during Pre-construction and Construction to increase the capacity of local women and men to capitalise on employment opportunities in this subproject and others.
- Encourage the use of the subproject grievance redress mechanism, which allows local women, men, youths, and others to report any practices that hinder local worker recruitment and create biased work conditions.

After mitigation, the residual impact on employment and livelihoods is rated as Minor.

7.2.3.4 Cumulative Impact

Considering other concurrent construction projects in the AOI, like the Overland and Noel Bridge subprojects and the Sandy Bay Coastal Defence project, additional job opportunities will be generated in the AOI, resulting in a cumulative impact on employment. However, doubt about local worker hiring practices will persist with the implementation of these projects as well unless corrective action is taken to remove the prevailing perception.

7.2.4 Community Health and Safety

7.2.4.1 Nature of Concern

The construction of the bridge may increase Overland and Sandy Bay residents' exposure to health and safety risks and impacts, with heightened risk to those closest to the construction sites. The risk and impacts will be mainly from dust pollution and increased noise and vibration, among others.

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7.2.4.2 Unmitigated Impacts

Dust Pollution

Construction activities are anticipated to bring about temporary changes in the local air quality. This will include fluctuations in exposure to fine particulate matter and nitrogen oxides, primarily from dust generation, exhaust emissions from construction vehicle traffic, and the utilization of equipment at construction sites (see Section 6.3.1.4). These effects will be further compounded by the presence of Sahara dust and prevailing dry periods.

Individuals residing in proximity to the construction site, particularly those with pre-existing respiratory and cardiovascular conditions, are expected to be particularly sensitive to these impacts. This vulnerability extends to those who typically remain home during construction work hours, including young children, infants, pregnant women, older adults and shut-ins. Notably, there are about 105 residences close to the construction site that could be affected by these changes.

Noise and Vibration

Similar to dust pollution, elevated noise and vibration levels will be temporary. However, prolonged exposure to repetitive and elevated noise levels stemming from construction activities, such as the movement of heavy trucks, operation of heavy equipment, and use of power tools, has the potential to cause neighbouring residents stress, annoyance and sleep disturbances and possibly exacerbate existing health conditions such as cardiovascular, hearing impairment and mental health conditions (see Section 6.3.1.5).

Construction activities, particularly the operation of heavy machinery and the passage of extra heavy vehicles, can generate vibration levels (see Section 6.3.1.5). This may pose a risk of damage to housing and buildings, especially those that are structurally vulnerable.

Vehicular Accidents

The expected safety risks can range from minor to major injuries from construction-related vehicular accidents on the Highway and near the construction site. These include incidents involving construction vehicles bringing materials and supplies to the site (including the transport of precast structures) and accidents involving the travelling public, pedestrians, and workers coming and going from their jobs at the construction sites.

Traffic management issues may also arise from the increased passage of fully loaded trucks on the Highway. Truck movement may also bring about an increase in the dust levels on the road. Traffic control and road wetting should be critical issues for the Construction Contractor.

The pedestrian environment on the bridges and their emerging road sections are of particular concern. It will be of importance that the walking environments of these bridges are inclusive, catering for all pedestrians, including persons with disabilities and older persons who may have difficulties accessing in and around the bridges, affecting their ability to remain independent and self-sufficient, get to places and be part of their community. In addition, the bridge should accommodate cyclists' use.

Work-related Accidents

Construction works may disrupt people's driving, walking, and cycling patterns near the construction sites and may create unsafe conditions for workers, drivers, passengers, and pedestrians unless the necessary safety measures are employed. Persons who will be particularly sensitive to such risk include children, persons with disabilities and older adults.

Accidents caused by erosion of river banks: Residents identified the occurrence of erosion and instability of the steep river banks close to the current bridge and spoke about the damage sustained to their properties and public infrastructure. At present, the instability of the river banks may present challenges during the construction phase and even during the operation phase should there be intense rainfall events that cause flooding and landslips that damage the bridge construction works.

Before mitigation measures, the impacts of bridge construction in London (dust pollution, noise and vibration, vehicular accidents, and work-related accidents) are classified as Moderate to Major.

7.2.4.3 Mitigation Measures

Dust Control

In addition to the mitigation measures listed in section 6.3.1.4.1.3. to reduce dust emissions, the following measures are available:

- Encourage the community residents and the public to submit their project-related air quality complaints through the Subproject GRM.

- Document all Subproject-related air quality grievances and their outcomes and take additional action to control dust emissions should complains persist.

Noise and Vibration

In addition to the mitigation measures listed in section 6.3.1.5.3. to reduce noise and vibration, the following measures are available:

- Encourage the community residents and the public to submit their project-related air quality complaints through the facility's GRM.

- Document all Subproject-related noise and vibration grievances and their outcomes and take additional action to reduce noise and vibration levels should complaints persist.

Vehicular Accidents

- Develop a traffic management plan that the construction contractor will implement to reduce the risk to and improve community road safety, including:

    - Using proper signage;
    - Establishing construction vehicle speed limits;
    - Training and ensuring the fitness of subproject drivers;
    - Regularly maintaining construction vehicles;
    - Establishing procedures for the transport of heavy equipment and loads;
    - Establishing a protocol for reporting vehicle accidents;
    - Maintaining a log of traffic-related incidents;
    - Establishing a community road safety awareness that can be shared in community meetings and with workers;
    - Establishing a protocol for night driving, and

- Establishing a monitoring mechanism to ensure effective implementation of the plan.

- Increase community awareness of the traffic management safeguards to be taken as part of the Subproject.

- Encourage community residents to use the established grievance mechanism that allows them to report and seek redress of their Subproject traffic grievances in a timely and effective manner.

- Document all Subproject-related traffic grievances and their outcomes.

Work-related Accidents

Mitigation measures listed in Sections 6.3.1.1.3 and 6.3.1.2.3 for erosion and slope instability are also applicable here. In addition, the construction contractor should develop and implement a Worker's Health and Safety Plan.

With the implementation of these mitigation measures the residual impact on community health and safety is rated as Minor.

7.2.4.4 Cumulative Impact

There are no other known projects in the vicinity of the London bridge site which may be occurring simultaneously so cumulative impacts are not anticipated.

7.2.5 Transport and Travel

Construction of the bridge at London has the potential to cause:

- Damage to the Windward Highway
- Traffic Delays Near the Construction Site

7.2.5.1 Damage to the Windward Highway

7.2.5.1.1 Nature of Concern

The capacity of sections of the Windward Highway passing through the AOI to accommodate increased usage by heavy vehicles and transport of heavy equipment during the construction phase should be taken into account to ensure smooth traffic flow and safety. The narrowing of sections of the road and sharp curves could present potential challenges for vehicle flow. The most critical will be the narrowness and capacity of the God-Save-the-Queen Bridge in Overland. However, the replacement of this bridge was started in March 2024.

7.2.5.1.2 Unmitigated Impact

The increased movement of heavy vehicles along the Windward Highway during the construction of the bridge may lead to the deterioration of the sections of the Highway, making it difficult for private and commercial drivers and commuters to travel along the Highway. Extensive damage to the Highway will become concerning if the construction phase includes days when visitor traffic is high (e.g., National Heroes Day).

Unmitigated, the impact of bridge construction at London on the deterioration of the Highway is considered as Moderate.

7.2.5.1.3 Mitigation Measures

Mitigation measures to be implemented include:

- Establishing a road repair programme for sections of the Windward Highway in the AOI that will be heavily used by the Subproject and other projects during construction and rectify any damage prior to the opening of the bridge.

- Engaging residents and local businesses to identify practical solutions to reduce logistical conflicts, road repairs, and heavy equipment delivery, and road safety.

- Erecting appropriate road safety signage to ensure public safety during construction.

After mitigation, the residual impact of the bridge construction on road conditions is rated as Minor.

7.2.5.2 Traffic Delays Near the Construction Site

7.2.5.2.1 Nature of Concern

Repeated and long traffic delays can create conflicts between the construction contractor and, residents and road users. The construction of the bridge may also discourage visitors from travelling to the area.

7.2.5.2.2 Unmitigated Impact

Traffic within the AOI, primarily consisting of minivans and private vehicles, may encounter delays near the construction site or when following heavy vehicles transporting materials and equipment to the site. These delays could be anticipated primarily during peak traffic hours, potentially resulting in tardiness for commuters heading to and from work, school, or other destinations. Goods vehicles travelling to the area usually operate outside of peak hours.

The impact of bridge construction in London on traffic delays is considered Minor

7.2.5.2.3 Mitigation Measure

The mitigation measure is to implement a Traffic Management Plan for the Subproject.

With the effective implementation of the Traffic Management Plan, the residual impact of the Subproject is rated as Minor.

7.2.5.3 Cumulative Impact

The transport and travel impacts are likely to be compounded with the other anticipated projects such as the Sandy Bay Sea Defence Resilience Project, the construction of critical river crossings in Overland, Noel, Owia and Fancy as well as other local construction projects. The projects will increase heavy vehicle traffic on the Highway, which can impede the flow of traffic and lead to delays for other road users. Increased heavy trucks can accelerate wear and tear on the road surface, leading to deterioration of the Highway.

7.2.6 Gender equality

Gender equality impacts are discussed under the following headings:

- Under-representation of women in the workforce
- Occupational health and safety hazards
- Gender violence and sexual harassment

7.2.6.1 Underrepresentation of Women in the Subproject workforce

7.2.6.1.1 Nature of Concern

Women entering or employed in the construction industry frequently face distinct challenges compared to men, which can hinder their prospects for employment and advancement. Additionally, they are vulnerable to discriminatory practices, safety risks, and gender-based violence, including sexual harassment. In St. Vincent and the Grenadines, traditionally, the construction industry is a male-dominated field with low participation of women despite their increased participation in construction-related training and education opportunities. Construction projects are characterised by physical labour, long hours, and a male-dominated culture. Consideration should be given to women by reducing gender disparities and gaps, implementing appropriate mechanisms to address any concerns they may have, and creating a construction site that is a safe workspace for them. Safeguarding the safety of AOI communities against negative worker action is also critical.

7.2.6.1.2 Unmitigated Impact

Men and women are expected to have different experiences accessing employment opportunities generated by the subproject. Without targeted interventions, women are unlikely to seek employment in the construction workforce. Even if they attempt to do so, they may encounter challenges in being hired due to their perceived lack of construction skills and experience and the prevailing notion that construction is primarily a male domain. Currently, the MoTW lacks a gender policy, and there are no contractual arrangements in place that mandate contractors to incorporate gender considerations in their hiring practices. Furthermore, there are no specific short-term training and/or apprenticeship programmes designed for women or youths in the AOI to enhance their involvement in local construction activities. Consequently, the workforce composition is anticipated to adhere to conventional patterns, with women being underrepresented in semi-skilled and unskilled positions, where most of the job opportunities will be available.

It will also be important for work conditions at the construction sites to cater for women workers, e.g., having dedicated toilet facilities, handwashing facilities, adequate protective gear, etc.

The impact is considered as Major.

7.2.6.1.3 Mitigation Measures

In addition to the local employment and livelihood measures, the following should be implemented:

- The contract for the construction contractor should include a provision encouraging the recruitment of local women for semi-skilled and unskilled positions, with a strong commitment to achieving meaningful female participation. The contractor should actively advertise job opportunities within the local community and collaborate with local organizations and training programmes to attract and prepare women for available positions.

- Encourage the participation of local women in skills training programs within the AOI by setting a target of 40 percent female participation. Where this target is not initially met, implement outreach and awareness efforts to ptomote enrolment and address potential barriers to participation.

After mitigation, this impact is rated as Minor.

7.2.6.2 Occupational health and safety hazards for women

7.2.6.2.1 Nature of Concern

Women, like men, have the right to a safe workplace. Both men and women working at a construction site face many of the same risks. However, there are some specific issues that are of greater concern to women, including reproductive hazards. The contractor is expected to protect the safety and health of men and women workers and others on the construction site, including paying attention to gender-related issues. Access to proper sanitary facilities and appropriate personal protective equipment and clothing, as well as ensuring their fit, are issues that women may face at the construction site.

7.2.6.2.2 Unmitigated Impact

The impact is considered as Major.

7.2.6.2.3 Mitigation Measures

- The construction contractor should be obligated to the following at the construction site:
    - Provide separate sanitary facilities for women and men and suitable and accessible facilities for washing (including an adequate supply of soap, ensuring that these facilities are maintained and kept clean and orderly.
    - Provide access to drinking water.
    - Ensure the use of protective equipment and wear (e.g., safety goggles, helmets, etc.).

- The worker training about the Subproject plans should also include sessions which sensitize workers about human rights, gender sensitivity, and the laws and policies relating to each plan. The sessions should be designed to be easily understand and interpreted by all.

After mitigation, the residual impact is rated Minor.

7.2.6.3 Gender Violence and Sexual Harassment

7.2.6.3.1 Nature of Concern

Gender-based violence (GBV) in St. Vincent and the Grenadines is a significant concern, with women and girls disproportionately affected and at higher risk of becoming victims. This includes different forms of violence, including domestic violence, sexual assault, harassment, and intimate partner violence. Efforts to address GBV in the country are crucial for ensuring the safety, well-being, and empowerment of women and girls, as well as promoting gender equality and human rights for all individuals. Sexual harassment is not explicitly addressed under any law in Saint Vincent and the Grenadines. According to the World Bank's Gender-Based Violence Profile for St. Vincent, there is no specific data on the extent and nature of sexual harassment; however, local women's groups and human rights organisations claim it is widespread, particularly in the workplace.

Although the Department of Gender Affairs has noted a low incidence of reporting regarding gender-based violence and bullying at the workplace, instances of male workers harassing women as they pass near construction sites have been observed. Moreover, should a construction contract for the bridge project be awarded to a non-national contractor, the utilisation of external workers may give rise to behaviours inconsistent with local norms and values, including cases of sexual harassment and other negative interactions between residents and the workers.

7.2.6.3.2 Unmitigated Impact

The impact is considered as Moderate.

7.2.6.3.3 Mitigation Measures

- Adopt a zero-tolerance approach toward all forms of gender-based violence (GBV) and violence against children (VAC), bullying and sexual harassment in the workplace and the community to create a hassle-free, safe and positive environment for female and male workers and others at the construction site and to maintain good relations with the communities.

- Establish a Code of Conduct for all workers and sub-contractors that promotes the respect of women, children and men and prohibits all forms of GBV and VAC, including bullying and sexual harassment.

- Ensure that all Subproject workers are aware of the Code of Conduct (see ESMP) through orientations or sensitization training and a manual detailing them.

- During community consultations, ensure that the residents are aware of the Code of Conduct that Subproject workers are expected to follow.

- Establish a Subproject Grievance Redress Mechanism (GRM) that facilitates reporting and addressing sexual harassment and gender violence complaints by residents and visitors to the area in a timely manner.

After mitigation, the residual impact is rated Negligible.

7.2.6.4 Cumulative Impact

In the event of multiple projects occurring simultaneously and large numbers of workers recruited from outside of the AOI, any negative behaviours, especially antisocial and criminal activities, can undermine community safety considerably and pose a challenge to social cohesion.

7.2.7 Cultural Heritage Resources

7.2.7.1 Nature of Concern

Cultural heritage refers to the legacy of tangible products (such as physical artefacts, monuments, human burial sites, built heritage sites, etc.) and intangible elements (oral traditions, performing arts, rituals) of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations (UNESCO Definition). Although tangible assets of anthropological and historical significance were noted in the AOI, none were reported within or near the bridge ROW. Nonetheless, given the strong Kalinago history and that artefacts have previously been unearthed in the AOI, there is the possibility of accidental finds (tangible cultural assets) at the project site during the Construction phase, especially while conducting earthworks/site preparation activities.

7.2.7.2 Unmitigated Impact

The potential impact may include damage or destruction of unknown artefacts through surface disturbance or excavation occurring in bridge construction, due to topographic or hydrological pattern changes or from soil movement (removal, erosion, sedimentation) at the construction site. Destruction or damage of artefacts may include not only the reduced integrity/form of the objects but also the disturbance of the spatial (horizontal and vertical) relationships between the artefacts and their surroundings that are critical to interpreting their meaning and cultural value.

The impact is considered as Minor.

7.2.7.3 Mitigation Measures

The measures to mitigate the impacts on heritage resources are:

- Collaborate with the National Trust during the planning and construction phases on matters relating to the identification and preservation of heritage resources at the construction site.

- During the planning stage, signing off on the *Chance Finds Procedure* (see ESMP) which sets out how the discovered finds associated with the project will be managed. The procedure includes a set of requirements if unknown cultural resources are discovered during construction. The Chance Finds Procedure should entail:

    - Suspending works in the vicinity of the discovery and immediately alerting the Ministry of Transport and Works and the National Trust.

    - Developing a protection fence around the perimeter of the find as guided by the National Trust to avoid any further disturbance.

    - Granting permission and ensuring the safety of National Trust personnel and cultural heritage experts for assessing materials and sites.

    - Working with the National Trust and Ministry of Transport and Works in determining and implementing a plan of action for preserving the found heritage resource.

    - Only resuming construction activities in the specific area if and when permission is granted to do so by the relevant authorities.

- Train project personnel, construction contractors and project workers on chance find procedures.

- Include the Chance Finds Procedure in all contracts relating to the construction of the bridge for the construction contractor and sub-contractors, including excavations and earthworks, diversion of the river or other changes to the environment to accommodate or as a result of construction activities. The contracts should also include requirements for training and penalties that will be incurred for the theft of discovered materials.

- Provide training to all employees and contractors on identifying and recognizing cultural heritage resources; the Chance Finds Procedure notification requirements and procedures; the identification of finds and handling of artefacts, remains, or sites identified during construction activities.

After mitigation, this impact is rated as Negligible.

7.2.7.4 Cumulative Impact

Multiple chance finds may raise cultural awareness about the history and significance of the area, fostering a sense of indigenous identity and pride among local residents and promoting their involvement and stewardship in preserving their heritage. On the other hand, finds from the different construction projects may result in increased archaeological activity in the area, leading to increased demands on resources, expertise, and time for investigations and preservation efforts, which may be beyond the resources of the National Trust and the National Government.

7.3 Potential Impacts – Maintenance / Operation Phase

This section discusses the potential impacts on the social environment that may arise during the maintenance and operation of the bridge at London. Maintenance activities are discussed in Section 2.1.3. The nature of the concern is described and where appropriate, mitigation measures are recommended and pre and post mitigation classifications are provided.

7.3.1 Local Employment

Bridge maintenance will include routine removal of the accumulated materials washed down the river beds to maintain the bridge's vertical clearance as well as other repair works. At present, BRAGSA is responsible for routine desilting and cleaning of the river beds in the communities north of the Rabacca River as well as maintenance and repair. They are expected to assume this responsibility for the new bridge, and its regular staff will perform the required activities. Therefore, bridge maintenance is not expected to significantly contribute to local employment.

7.3.2 Traffic Volume

7.3.2.1 Benefit

Residents have reported that the temporary bridges were beneficial in increasing the traffic volume, including goods vehicle traffic, and they anticipated that the new bridge will facilitate at least the same level of traffic volume when it is operational.

7.3.2.2 Adverse Impact

The impact on traffic volume may however be temporarily disrupted when certain maintenance activities such as repairs to the wearing surface are being undertaken.

The impact is considered Minor and is expected to occur once in 10 years and will be of short duration.

7.3.2.3 Mitigation Measures

The potential impact on traffic flow during bridge maintenance can be mitigated by developing and implementing a Traffic Management Plan for the short duration proposed works. Effective implementation of this Plan is expected to reduce the potential impact to Negligible.

7.3.2.4 Cumulative Impact

The cumulative impact on traffic flow across the London bridge when repairs to the wearing surface is being carried out approximately every 10 years cannot be discussed as it is unknown at this time what other projects may be in progress at the time.

7.3.3 Community Health and Safety

Exhaust emissions from the increased traffic volumes could have health effects on roadside residents. Increased traffic volumes also increase the risk of accidents.

7.3.3.1 Unmitigated Impact

During operation, potential impacts on community health and safety will be associated with increased road traffic, which can contribute to higher tailpipe emissions, such as carbon monoxide, nitrogen oxides, and particulate matter. Long-term exposure to vehicular emissions can pose a health risk to roadside residents. However, it is anticipated that the impact of the increased traffic on human health will be Minor, given the low-traffic volume environment in the rural AOI and the prevailing winds active along the AOI coast.

The increased traffic volumes can increase the risk of traffic accidents. Residents reported that one of the most common accidents occurring on the current bridges in the AOI was drivers colliding with bridge railings.

7.3.3.2 Mitigation Measures

Mitigation measures to address community road safety in the vicinity of the London bridge include:

- Proper signage;
- Proper lighting;
- Enforcement of vehicle speed limits; and
- Establishing a community road safety awareness programme.

Effective implementation of these measures in accordance with the requirements of the MoTW is expected to reduce the potential impact to Negligible.

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8 RECORD OF CONSULTATIONS

This chapter provides a summary of the concerns raised by stakeholders during interviews and focus group discussions with the affected communities.

8.1 Stakeholder Identification and Analysis

People, who may be affected by a project and its activities, have the basic right to know what will happen, express their opinions, and be heard without fear or interference (Article 19 of the Universal Declaration of Human Rights, 1948 and as ratified by St. Vincent and the Grenadines). This basic right is also enshrined in the Constitution of St. Vincent and the Grenadines, which recognises people's right to access information and participate within a framework of the freedoms of thought and expression, assembly, and association.

Stakeholders' rights to access information about and participate in the proposed project are addressed in the VEEP Stakeholder Engagement Plan (SEP), which is consistent with the World Bank Environmental and Social Standard (ESS) 10. The specific objectives of the VEEP SEP are as follows:

- Identify stakeholders and build and maintain a constructive relationship with them, in particular, project-affected parties (PAPs).

- Assess the level of stakeholder interest and support for the project and ensure stakeholders' views are considered in project design and environmental and social performance.

- Promote and provide means for effective and inclusive engagement with PAPs throughout the project life cycle on issues that could potentially affect them.

- Ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible, and appropriate manner and format.

- Provide project-affected parties with accessible and inclusive means to raise issues and a grievances redress mechanism to respond to and manage grievances.

The ESS 10 requires the engagement of PAPs, who may be directly and indirectly affected, in addition to others who may have an interest in the Subproject. It is important that stakeholders are provided with reliable information and given a platform to voice their views and concerns about the proposed construction project.

Stakeholder engagement aims to ensure that stakeholders' legitimate needs and expectations, in addition to their views and experiences, are captured and integrated as part of the ESIA and ESMP. The SIA, therefore, is based on an approach where a high degree of engagement of stakeholders is required. The issues identified by stakeholders formed the basis for identifying and evaluating the potential social impacts. Section 8.2 (The Stakeholders) provides an overview of the approach to stakeholder engagement used in the ESIA, highlighting the key stakeholder categories, their key development concerns, and potential impacts identified by stakeholders. Stakeholder engagement activities ranged from semi-structured interviews to focus group discussions with the affected communities, vulnerable groups, Community-based organizations, and government institutions. A Stakeholder Engagement Report is provided as Appendix F.

8.2 The Stakeholders

Stakeholder refers to individuals, groups and communities who have a stake in the Subproject, including those who will be affected by the planning (pre-construction), construction and operation of the bridges (Subproject-affected parties) or those who have an interest in or will influence the Subproject (other interested parties). Some groups within the affected parties, because of their social and economic status, may be more susceptible to the harmful impacts of a potential risk, and these impacts could deepen their vulnerability.

Using the approach applied in the VEEP SEP, stakeholders for the bridge subproject are categorized into three categories: a) subproject-affected parties, b) other interested parties, and c) vulnerable groups. Each stakeholder category is defined in Figure 8.1.

8.2.1 Subproject-affected Parties

These stakeholders include residents (individuals, households, business operators, etc.), groups, institutions, and communities of Overland, Sandy Bay, Owia and Fancy. The affected communities include those where the bridges will be built – Overland (Overland Bridge), Sandy Bay (Noel Bridge and London Bridge), along with those further north that will use the bridges routinely as part of their daily lives (Owia and Fancy).

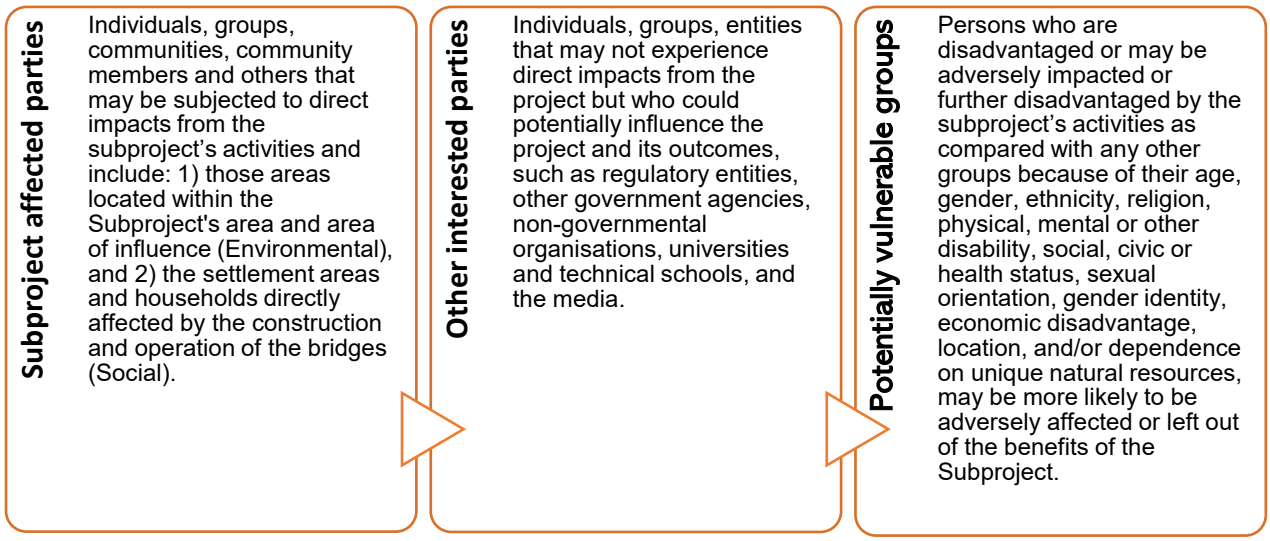


FIGURE 8-1: STAKEHOLDER CATEGORY DEFINITION

8.2.2 Other interested parties

Other Interested Parties include the following stakeholders:

- NGOs involved in or with environmental stewardship/advocacy, gender equality, indigenous peoples, cultural heritage conservation, and natural resources management – the SVG Network of Rural Women Producers, the Arrowroot Farmers Association, the Garifuna Heritage Foundation, the Rabacca Vegetable Farmers' Cooperative, the Fancy Vegetable Farmers' Cooperative, and the Fancy Unity Farmers' Cooperative.

- Institutions offering technical vocational skills training courses.

- Regulatory agencies - the Physical Planning Department, the Land and Surveys Department, the Land Management Unit, the Environmental Management Department, the Forestry Department, the Fisheries Division, the SVG Tourism Authority, and the National Parks, Rivers and Beaches Authority.

- Non-regulatory government departments - the Department of Gender Affairs, the Community Development Division, the Youth Department, the Agricultural Extension and Advisory Services Department, the Health Planning and Information Unit, the National Emergency Management Office (NEMO), the SVG Meteorological Office, the Statistical Office, the Labour Department, the Local Government Division, the Sustainable Development Unit, the SVG National Trust, Housing and Informal Settlement and the Economic Planning Department.

- Public utilities - the Central Water and Sewage Authority (CWSA), St Vincent Electricity Services (Vinlec), Digicel, LIME and Karib Cable.

8.2.3 Potentially Vulnerable Groups

According to WB ESS10, the disadvantaged or vulnerable refers to those who may be more likely to be adversely affected by the project impacts and/or more limited than others in their ability to take advantage of a project's benefits. Such an individual/group is also more likely to be excluded from/unable to participate fully in the mainstream consultation process and as such may require specific measures and/or assistance to do so.

The disadvantaged and vulnerable groups within the Subproject Affected parties include:

- The indigenous peoples, the largest population group in the AOI region, are residents who self-identify as Garifuna or Carib. They use the Windward Highway to travel to and from their communities to their schools, workplaces, commercial and administrative locations, and other activities.

- Farmers, including female farmers and young farmers who sell vegetables, root crops, arrowroot, and tree crops use the highway and bridges to access markets and purchase inputs. Traffickers travel to the AOI to buy the farmers' produce.

- Fisherfolk, including female and young fisherfolk, who use the Windward Highway to access markets and purchase resources critical to fishing activity.

- Persons with disabilities (PWDs), inclusive of those with mobility, visual, audio, and other disabilities, who are likely to have lower access and mobility because of their dependency and reliance on their caregivers.

- LGBTI people who may be impaired from accessing information and participating in the benefits of the Subprojects due to factors of discrimination or by not taking adequate measures to include them in the stakeholder engagement processes.

- Poor households – according to the 2008 Country Poverty Assessment (CPA) living the AOI communities which among the poorest in Saint Vincent and the Grenadines.

- Single-parent and female-headed households who are more likely to live in poverty than other households.

- Older adults (the elderly) who tend to have lower access and mobility because they are dependent on others and exposed to more chronic diseases than other age groups.

- Children who tend to have lower access and mobility because they depend and rely on their parents and caregivers.

- Persons with pre-existing health conditions like asthma, hypertension, heart conditions, etc.

- Unemployed men and women who are seeking job opportunities.

Based on the VEEP SEP, stakeholders were analyzed based on their level of importance to the Subproject (low, medium, high) versus their influence on the outcome of the Subproject. The results of the analysis are presented in Table 8-1 and elaborated in Appendix F Stakeholder Engagement Report. Community stakeholders can be prioritized according to the level at which they are likely to be affected by the Subproject (how the Subproject will affect people's livelihoods and lives).

TABLE 8-1: LEVEL OF IMPORTANCE AND INFLUENCE OF SUBPROJECT STAKEHOLDERS

KEY STAKEHOLDER	STAKEHOLDER	IMPORTANCE OF THE STAKEHOLDER (HIGH, MEDIUM, LOW)	INFLUENCE ON THE OUTCOMES OF THE SUBPROJECTS (HIGH, MEDIUM, LOW)
Subproject-affected parties	Residents, households, community groups and institutions of Overland, Sandy Bay, Owia, and Fancy. Settlements where the bridges will be constructed (Overland, Noel, London)	High	High
	Local groups, including religious, farmers, indigenous, sports, disaster response CBOs, and other CBOs.	High	High
	Windward Highway users – residents, workers, commercial drivers, visitors, pedestrians, cyclists.	High	Medium
Other interested parties	NGOs involved in or with environmental stewardship/advocacy, gender equality, indigenous peoples, cultural heritage conservation, and natural resources management.	Medium	Medium

KEY STAKEHOLDER	STAKEHOLDER	IMPORTANCE OF THE STAKEHOLDER (HIGH, MEDIUM, LOW)	INFLUENCE ON THE OUTCOMES OF THE SUBPROJECTS (HIGH, MEDIUM, LOW)
	Institutions offering technical vocational skills training courses.	Medium	Medium
	Regulatory institutions.	High-Medium	High-Low
	Non-regulatory institutions.	High-medium	High-Low
	Public utilities	Medium	Low

It should be noted that the rating of stakeholders may change as the project progresses based on the changing influence of stakeholders on the outcomes of the Subproject and changes to the stakeholder landscape. The list of stakeholders at the community and institutional level with whom the project should engage and consult throughout the life of the project is provided in the Subproject Stakeholder Engagement Plan (see ESMP).

8.3 Results of Stakeholder Engagement Activities

Projects can yield both positive and negative outcomes and impacts, potentially alleviating or exacerbating existing developmental concerns within communities. It is crucial to comprehend these challenges and incorporate them into the assessment of potential project impacts. The ESIA aims to meet a crucial TOR obligation by actively involving stakeholders in describing their environment and incorporating their inputs as an integral component of the analysis of impacts. To fulfil this obligation, a total of 55 interviews and discussions were carried out, consisting of 20 institutional interviews and 35 individual interviews and focus group discussions within the AOI. Numerous individuals, totalling 115 (44 men and 71 women), actively participated in this process, and a detailed breakdown is available in Appendix F (Stakeholder Engagement Report).

The interviews and discussions conducted in a semi-structured format enabled participants to share insights into their circumstances and provide feedback on the proposed bridge. This approach facilitated an understanding of community life, anticipated impacts of the bridge, and considerations crucial for bridge design.

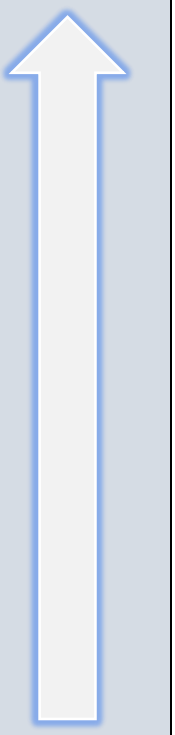
The Ministry of Economic Development will be planning a public consultation. This event will serve as a platform to involve the AOI communities and interested members of the public. It aims to present the conceptual designs of the bridges, gather input, address concerns, and collect feedback regarding the Subproject. The results of the consultation will play a pivotal role in finalising the bridge design.

8.3.1 Stakeholder Concerns

Stakeholders identified a number of issues that affect the development of their communities (Appendix F: Stakeholder Engagement Report). Table 8-1 prioritizes the issues and concerns identified by community stakeholders. The five issues most identified by community stakeholders were economic in nature, in contrast to the economic and social concerns identified by institutional stakeholders. Unemployment was by far the most identified concern reported by both community and institutional stakeholders, with youth unemployment singled out as a major development concern. The unemployment situation was said to have been exacerbated by the eruption of La Soufrière and the COVID-19 pandemic.

TABLE 8-2: MAIN ISSUES IDENTIFIED BY COMMUNITY STAKEHOLDERS CRITICAL TO THE DEVELOPMENT OF THE AOI

No.	*Main issues identified by community stakeholders*
1.	High unemployment and underemployment
2.	High youth unemployment
3.	Limited employment opportunities in North Windward communities
4.	Perceived lack of fairness and transparency regarding hiring practices on public works projects
5.	High transportation cost
6.	Instability of riverbanks which put some houses and properties in jeopardy of collapse.
7.	Increased incidence of persons with respiratory conditions in the aftermath of La Soufrière eruption
8.	Limited support for entrepreneurial development – youths, women, men
9.	Eroding intergenerational relations and community cohesion
10.	Inadequate education and skills hindering access to available jobs
11.	Poor agricultural feeder roads
12.	Difficulty in driving along specific sections of the highway
13.	Vulnerability of North Windward St. Vincent to natural hazards – climate change, rising sea level, intense rainfall, hurricanes and storms, flooding, landslides, volcano eruption and lahars
14.	Damage and socioeconomic impact of natural disasters



Agriculture serves as the cornerstone of the AOI, being the main local economic activity that contributes to local livelihoods, employment, and family income. With the absence of alternative economic activities and a declining interest among youths to engage in agriculture, residents have pinpointed a scarcity of economic opportunities in AOI communities as a significant factor contributing to unemployment, particularly youth unemployment. Because of this, outside of farming, residents worked outside of the AOI in government services, tourism and construction.

Women emphasized the difficulty posed by high transportation expenses, which discouraged them from pursuing employment in Kingstown and nearby areas. The available job opportunities in the Capital, such as store clerks, were insufficient to offset the burden of the associated high transportation costs. Additionally, young people cited a lack of training and skills as a barrier to accessing jobs with higher skill requirements. Moreover, there was limited support for individuals interested in establishing businesses. Women who were balancing childcare and domestic responsibilities expressed a preference for jobs closer to home.

Nonetheless, the Government also offered temporary employment within the AOI through its annual road cleaning programme, which occurred once or twice a year, and various public works projects. However, there was no assurance of local employment opportunities, as contractors often brought in external workers despite the high unemployment in the area. The tradition of associating construction work predominantly with men, coupled with the perception that men are better suited for such roles, made women residents less motivated to actively seek and secure employment in local public works projects. Additionally, the roles traditionally held by women as water carriers became obsolete with the introduction of technologies like concrete mixers.

Moreover, residents viewed the recruitment practices for the limited job opportunities on public projects as both unfair and unclear. They advocated for equal access to employment opportunities, regardless of affiliations, and stressed the need for transparency in the job recruitment process. They proposed the implementation of a rotation system for job opportunities, particularly given the prevailing high unemployment rate in the community, to ensure that everyone has an equitable chance to access employment opportunities.

Special mention must be made of the slow recovery of agriculture in the AOI in the aftermath of the volcano eruption, which had increased difficulties for regular farmers and those ‘returning to the land’ with the rise of unemployment. The destruction of the arrowroot factory, the impact of the widespread ashfall on the agricultural fields, and the ensuing crop and financial losses were among the challenges farmers faced.

Usually, most farmers sell their produce to middlemen, commonly referred to as traffickers, who journey to the AOI to acquire produce. However, the purchasing practices of middlemen did not always favour farmers. Specifically, these middlemen did not provide upfront payment for produce at the farmgate; instead, farmers only received payment upon the traffickers' return to the area or after the sale of the produce. As a result, farmers encountered payment delays or, in some cases, did not receive payment at all.

Drawing from their lived experiences, residents recognized the AOI's susceptibility to climate change and natural hazards, vividly recalling the impact of specific disasters on their lives.

Apart from the unemployment situation, institutional stakeholders prioritized issues/concerns that were different from those identified by residents. Poverty, followed by teenage pregnancy, limited local employment opportunities, lifestyle diseases, and the incidence of single-mother households were the five most identified concerns critical to the development of the AOI (see Table 8-3).

TABLE 8-3: MAIN ISSUES IDENTIFIED BY INSTITUTIONAL STAKEHOLDERS CRITICAL TO THE DEVELOPMENT OF THE AOI

No.	*Main Issues identified by institutional stakeholders*
1.	Incidence of poverty
2.	Teenage pregnancy
3.	Limited local employment opportunities in North Windward communities
4.	Lifestyle diseases
5.	Single-parent households, primarily single mothers
6.	Vulnerability of North Windward St. Vincent to natural hazards
7.	Damage and socioeconomic impact of natural disasters
8.	School absenteeism and dropout
9.	Underperformance of male secondary school students
10.	High youth unemployment and underemployment

8.3.2 Residents' Perception of the Proposed Subproject

Overall, there is a high level of community acceptance of the Subproject, with residents overwhelmingly indicating that it would be beneficial to the communities. The temporary bridges brought great relief to the people of the North Windward region, ensuring that residents and visitors could move freely to and from the area.

Residents indicated that on rainy days with strong river flow, logs and other debris come down the mountainside, occasionally blocking the London culvert and hindering people's movement to and from the northern side of Sandy Bay and the communities further north (Owia and Fancy). Usually, people would abandon their plans to travel out of their communities and would usually stay home. It was a common occurrence for people to be absent or late for work and school when the river levels were high.

Residents believed the new bridge would further improve access, leading to a greater influx of people and increased traffic to local attractions and events (like the Owia Salt Pond Recreation Site, Fancy Garifuna Cultural and Culinary Festival, Nine Mornings Festival). Given the planned construction activities anticipated in the AOI over the next two years or so, there will be an increased presence of heavy vehicles on the highway and bridges.

Additionally, business owners who are accustomed to travelling to Kingstown to procure goods and services for their businesses foresee that improved access will significantly reduce the number of such trips.

Residents also recognize that the Subproject would create job opportunities. However, they raise questions about the extent to which local individuals will be employed.

Based on their experiences, residents offered several considerations for bridge design:

1. The bridge spanning the Agrika River at London needs to be elevated beyond its current structures to accommodate lahar flow and ease of maintenance.

2. The bridge should be designed to accommodate two-way traffic flow.

3. Considering the expected rise in traffic, the new bridge should have the capacity to support heavier classes of vehicles and equipment.

4. Robust guardrails should be installed along the bridge to prevent individuals, cyclists, and vehicles from falling off and to safeguard the structures from damage during vehicular accidents or flood events. Residents' preferred choice for guardrails is concrete; if steel is considered, it should be incorporated into the concrete (reinforced concrete). Furthermore, residents emphasized the importance of extending the guardrails a considerable distance along the approach to the bridge.

5. To guarantee the safe passage of pedestrians across the bridge, a dedicated walkway should be established to accommodate individuals of all ages, including older adults (the elderly), PWDs, and children. The walkway should be equipped with guardrails to shield pedestrians from moving vehicles on the bridge and prevent larger vehicles, especially trucks and heavy vehicles, from encroaching onto the walkway. The guardrails should be designed to assist individuals with mobility challenges while ensuring that the walkway is accessible to those using wheelchairs. Additionally, the walkway should extend for a considerable distance along the approach to the bridge.

6. The construction of the bridge should adhere to their original design specifications. There is a need for higher construction quality, increased accountability from the contractors responsible for the works, and improved supervision of the construction process.

7. Improved signage is necessary to notify drivers as they approach the bridge and to encourage them to reduce speed. These signs should be user-friendly and positioned at a height that ensures easy readability.

8. It is essential to illuminate the bridge at night or install reflectors to aid drivers in navigating the entrance and traversal of the bridge.

9. Considering that the bridge will be constructed in a region with a rich indigenous history, they should serve as significant landmarks depicting the heritage of the area and the local community.

10. The Subproject should prioritize maximizing local employment opportunities and establish an impartial and transparent system for recruiting local workers, with clear communication to residents. Particular emphasis should be placed on including women and young people in the workforce.

8.4 Public Consultation

A public consultation meeting for the London Bridge was held on October 24, 2024, at London Bridge, Sandy Bay. Details are presented in Attachment 4 of the Stakeholder Engagement Report found in Appendix F as follows:

I. New London Bridge Public Consultation Press Release
II. New London Bridge Information Brochure
III. Public Consultation Agenda
IV. Presentations by Trintoplan Project Team
V. New London Bridge Public Consultation Register
VI. Photos from the New London Bridge Public Consultation

There was one question regarding the date for completion of the bridge to which Honourable Prime Minister Dr. Ralph E. Gonsalves responded.