8.0 ENVIRONMENTAL MANAGEMENT PLAN

8.1 Objectives

The objective of this EMP is to create a framework which, if followed correctly, will reduce the intensity or occurrence of environmental impacts. Its objectives are:

- To ensure that all parties involved in the proposed development fully understand the environmental protection measures and environmental monitoring which have been stipulated for this work and;
- To ensure that mitigation and monitoring are undertaken in a timely fashion.

8.2 Approach

This Environmental Management Plan (EMP) consists of the development of two (2) specific plans, namely: the Mitigation Management Plan and the Monitoring Plan. The development of EMP involved the following steps:

- Potential adverse environmental impacts of the project were identified and assessed as part of an Environmental Impact Assessment.
- Appropriate mitigation measures were prescribed for each adverse environmental impact.
- The party responsible for carrying out the mitigation actions was identified in the context of the institutional arrangements for the project.
- The timing for each action was defined, along with specialized equipment or material required and competence and specialized environmental training needed.

- The direct environmental cost for implementing each mitigation action was estimated. It should be noted, however, that in many cases the cost of implementing mitigation actions is a part of the normal construction cost, and therefore not shown as a separate cost.

- Monitoring requirements were also recommended for each adverse environmental impact.

- The party responsible for monitoring was identified in the context of the institutional arrangements for the project.

- The timing and location for monitoring events were described, along with specialized equipment or material required and competence and specialized environmental training needed.

Based on the impact identification exercise undertaken as part of the Environmental Impact Assessment, the following potential impacts were identified:

Construction Phase

- Slope Instability;
- Impaired Water Quality
- Soil Contamination
- Noise and;
- Impaired Air Quality.

Maintenance/Operation Phase

- Impaired Water Quality and;
- Improperly Disposed Solid Waste.

8.3 Management Structure

This Section describes the likely management arrangements for implementing the EMP, for both the construction and maintenance phases.

8.3.1 Construction Phase

Appendix 4 shows the likely organization structure for the management of the construction phase of this development. Key functions on this chart are assigned to:

- Ministry of Transport, Works, Urban Development and Local Government;
- The Supervising Engineer (Geotech Associates Limited) and;
- The Construction Contractor.

a) Ministry of Transport, Works, Urban Development & Local Government

The Ministry of Transport, Works, Urban Development and Local Government (MoTWUDLG) is responsible for developing and maintaining all public assets and supporting other ministries and government agencies in the execution and implementation of projects. The MoTWUDLG will function as the Owner/Developer and be responsible for overseeing the overall execution of the project during the construction and operation phases.

b) Supervising Engineer

Geotech Associates' Supervising Engineer will be responsible for overseeing the day-to-day construction works. His Supervising Team will likely be headed by a Project Manager, who will supervise Engineers and Environmental Professional(s). The Engineers will supervise technicians in verifying that the works are being undertaken in accordance with the design drawing and specifications, while the Environmental Professional(s) will supervise Environmental Inspector(s) in verifying that the mitigation measures are effectively implemented and in monitoring environmental quality during the construction phase. The Supervising Engineer will also be responsible for reviewing and commenting on any supplemental plans prepared by the Contractor.

c) Construction Contractor

The Contractor will be responsible for construction and associated works in accordance with the design prepared by Geotech Associates Limited and contractual requirements specified by MoTWUDLG. Specific roles and responsibilities covered by the Contractor's team will likely comprise:

- Construction Manager;
- Health, Safety and Environment (HSE) Manager and Officer(s);
- Construction Supervisors and;
- Foremen, skilled construction workers and labourers.

The Construction Manager will manage the work of his own staff and subcontractors. The Contractor's Health, Safety and Environment (HSE) Manager will report to the Construction Manager. Each team on the Contractor's staff (earthworks, concrete works, etc.) and each subcontractor will be headed by a Construction Supervisor, who will manage the work of foremen, skilled construction workers and labourers. The Contractor's HSE Manager and HSE Officers will assist the Construction Manager in managing the environmental and occupational health and safety aspects of the contract. The Construction Contractor is also responsible for preparing and implementing an Emergency Response Plan (ERP) in accordance with project procedures.

8.3.2 Maintenance Phase

As part of their mandate to maintain public roads and assets, the Ministry of Transport, Works, Urban Development and Local Government (MoTWUDLG) will perform routine maintenance as needed after construction. This may or may not be done through a contractor.

8.4 HSE Competence & Training

This Section specifies the HSE competence and training required by key persons in the EMP. During construction, the Contractor will be responsible for providing the necessary training and measures to raise environmental awareness of all staff working on the project, including subcontractors to ensure that environmental mitigation and safeguards in the EMP are properly implemented.

During operation, the MoTWUDLG will be responsible for ensuring that all key personnel receive environmental training to ensure that the EMP is properly implemented.

Specific requirements on the Contractor's and Supervising Engineer's environmental personnel are provided in the subsections below.

8.4.1 Contractor's Personnel

- HSE Manager - the HSE Manager would typically have at least a Bachelor's degree in Health, Safety and Environmental Management, and have at least 5 years experience in managing and implementing relevant mitigation measures and monitoring.

- HSE Officer - the HSE Officer would typically have at least a Diploma in Health, Safety and Environmental Management, and have at least 3 years experience in implementing relevant mitigation measures and undertaking monitoring, OR have at least 5 years experience in implementing relevant mitigation measures and monitoring.

8.4.2 Supervising Engineer's Personnel

- Environmental Professional - the Environmental Professional would typically have at least a graduate degree in Health Safety and Environmental Management with 4 – 5 years experience in implementing relevant mitigation measures and undertaking monitoring and HSE audits.

- Environmental Inspector - the Environmental Inspector would typically have at least a Diploma or Certificate in Health Safety and Environmental Management with 2 years experience in implementing relevant mitigation measures and undertaking monitoring and HSE audits.

8.5 Record Keeping

During the construction works, a variety of records should be maintained onsite by the Contractor's HSE Officer. These include:

- Air and Noise monitoring records.
- A register for public complaints arising from impacts such as noise, air quality, traffic, damage to infrastructure, loss of access, and health and safety concerns.

- A register for documenting how frequent portable toilets are emptied and cleaned, including the haulage and disposal records.
- A register for documenting how frequent garbage bins are emptied, including the haulage and disposal records.
- A register for accidents and incidents arising as a result of construction works.
- A register of spills and leaks of hydrocarbons.
- A register documenting the maintenance of vehicles and equipment.

In addition, the HSE Officer will have to maintain a manifest of all inspections undertaken by him and any other Contractor personnel. Non-compliance observations or complaints, accidents, incidents will require reporting so that such an issue can be addressed.

8.6 Preparation of Specific Plans

The preparation of the following plans was recommended as part of the Environmental Impact Assessment of the proposed works in Belle Isle:

- A Site Grading and Management Plan;
- An Erosion Control Plan and;
- Waste Management Plan

8.6.1 Site Grading & Management Plan

A Site Grading and Management Plan to identify areas of disturbance, areas of cut and fill, slope during and after grading, existing vegetation, and measures to protect slope, drainages, and existing vegetation in the project area.

8.6.2 Erosion Control Plan

This Erosion Control Plan (ECP) should provide guidance to the Construction Contractor on implementing measures to reduce erosion during earthworks. The main components of the ECP may include the following:

- Description of the erosion potential of the soil based on geotechnical studies undertaken.

- Description of the phasing or schedule of earthwork.
- Measures to be used to stabilise slopes, minimize soil loss and reduce sedimentation including preparatory work, installation and removal.
- Identification of persons with responsibilities under the plan.

8.6.3 Waste Management Plan

A Waste Management Plan (WMP) is a plan that identifies the various streams that will be generated during work, how these wastes will be stored onsite, transported and ultimately disposed. This type of plan will serve as a guide to the Contractor on managing waste and a benchmark for the Supervising Engineer's inspectors.

The main components of this WMP should include, but not be limited to the following:

- Provision of secured receptacles for the disposal of wastes. Separate containers should be used for food wastes, domestic wastes and construction debris.
- Schedule for which the containers will be emptied, by whom (a suitable waste disposal company) and their disposal locations (an approved landfill).
- Provision of portable toilets on site, as well as a schedule for which the toilets will be emptied, by whom (a suitable waste disposal company) and their disposal locations.
- Include the management of hazardous waste.

8.7 Environmental Procedures for Construction Phase

This Section presents the procedures for addressing environmental concerns during the construction phase.

8.7.1	**POTENTIAL IMPACT**	**Slope Instability**
MITIGATION MEASURES		< Ensure that cut slopes be cut to a minimum slope angle based on the recommendations of the geotechnical investigation to minimize the potential for future slippage. Ensure that excavated areas (if required) are shored. < Construct surface cut drains at the top of major cuts or along cleared slopes to facilitate run off and prevent the formation of ruts along the

8.7.1	POTENTIAL IMPACT	Slope Instability
		slope. Ensure that these are maintained until permanent growth of vegetation has been firmly established. < Where heavy equipment are to be used on site, ensure that the toe of the slope is secured. Do not store material or operate heavy equipment close to the edge of excavations. < Vegetate cleared areas as soon as practical after construction to reduce the effects of erosion during heavy rainfall, using Vetiver, for example.
ACTION BY		▸ Contractor's Supervisor to oversee earthworks conducted by heavy equipment operators.
TIMING		During construction phase
SPECIALIZED EQUIPMENT OR MATERIAL		None. Vetiver is widely used in St. Vincent for erosion control
SPECIALIZED COMPETENCE & TRAINING		Replanting/re-vegetation of slopes
MONITORING/VERIFICATION		
HOW / BY WHOM/, WHAT / WHERE/, FREQUENCY		▸ Supervising Engineer to verify the cuts during works and give instructions to the Contractor as needed.
SPECIALIZED EQUIPMENT OR MATERIAL		None

8.7.2	POTENTIAL IMPACT	Impaired Water Quality due to Fuel Spills & Disposal of Spent Lubricants
MITIGATION MEASURES		< Prohibit fueling or servicing of vehicles on-site (to the extent practical) or designate a specific area for fueling and servicing of vehicles. < Keep spill kits with absorbent pads on site to respond to spills, rather than "washing-down" the area. < Use appropriate pumps, hoses and nozzles for refueling and place disconnected hoses in containers after refueling to prevent spills of residual fuel. < Vehicles and construction machinery should be routinely serviced to ensure that there is no leakage from equipment.

8.7.2	POTENTIAL IMPACT	Impaired Water Quality due to Fuel Spills & Disposal of Spent Lubricants
		< Transport collected spent lubricants off-site to a facility capable of treating and/or disposing of waste of this kind. < In the event of a spill, collect contaminated soil and remove from the site to a suitable remediation facility.
ACTION BY		Construction Contractor
TIMING		< Areas for storing of spilled and spent lubricants, for storing bulk fuel, and for undertaking refueling and maintenance actives to be designated prior to the start of construction works. < All other mitigation measures to occur during construction phase.
SPECIALIZED EQUIPMENT OR MATERIAL		< Spill Kits < Specialized containers for the collection of spent oils, lubricants, and clean up materials.
SPECIALIZED COMPETENCE & TRAINING		Spill response training
MONITORING/VERIFICATION		
HOW / BY WHOM/, WHAT / WHERE/, FREQUENCY		▸ Contractor's HSE Officer will conduct visual inspections daily throughout the construction phase on vehicles and equipment, storage containers, refueling and maintenance areas for leaks, and for spills and maintain a log of all spills, leaks and disposals of spent lubricants in the construction log book. ▸ Supervising Team's Environmental Inspector to conduct fortnightly checks and review visual inspection records and verify implementation of correction and preventative actions.
SPECIALIZED EQUIPMENT OR MATERIAL		None required

8.7.3	POTENTIAL IMPACT	Impaired Water Quality due to Concrete Washings
MITIGATION MEASURES		< Prohibit the discharge from concrete washings into the neighbouring watercourses or in surface drains. < Establish a well-identified earthen pit on the site into which concrete washings will be allowed to enter. This pit should be lined with plastic. After evaporation of the water, the hardened material should be regularly removed and sent for disposal at an approved landfill. < All tools and equipment that came into contact with concrete or cement must also be washed such that the wash water flows into the pit, or they

8.7.3	POTENTIAL IMPACT	Impaired Water Quality due to Concrete Washings
		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.
ACTION BY		Contractor's Foreman to implement mitigation measures on instruction from Construction Supervisor
TIMING		Construction phase
SPECIALIZED EQUIPMENT OR MATERIAL		< Liner for concrete washout pit (if an earthen pit to be constructed) < Prefabricated washout pit may be used instead of lined pit
SPECIALIZED COMPETENCE & TRAINING		No specialized competence or training
MONITORING/VERIFICATION		
HOW / BY WHOM/, WHAT / WHERE/, FREQUENCY		▸ Contractor's HSE Officer will conduct daily visual inspections whenever concrete work takes place throughout the construction phase. ▸ Supervising Team's Environmental Inspector to conduct fortnightly checks and review visual inspection records and verify the effectiveness of the concrete washout area.
SPECIALIZED EQUIPMENT OR MATERIAL		None required

8.7.4	POTENTIAL IMPACT	Impaired Water Quality from Improperly Disposed Solid Waste
MITIGATION MEASURES		< The provision of solid waste bins at active construction sites. Ensure that these bins are secured and protected from animals and other scavengers. These bins should be emptied regularly and the waste disposed of at an appropriate waste disposal facility.
ACTION BY		Construction Supervisor
TIMING		Acquisition of appropriate waste receptacles to be done prior to the start of construction works.
SPECIALIZED EQUIPMENT OR MATERIAL		< Secure bins

8.7.4	POTENTIAL IMPACT	Impaired Water Quality from Improperly Disposed Solid Waste
SPECIALIZED COMPETENCE & TRAINING		None required
MONITORING/VERIFICATION		
HOW / BY WHOM/, WHAT / WHERE/, FREQUENCY		▸ Contractor's HSE Officer will conduct daily visual inspections throughout the construction phase. ▸ Supervising Team's Environmental Inspector to conduct fortnightly checks to verify waste is being properly managed on the site and review visual inspection records and disposal certificates.
SPECIALIZED EQUIPMENT OR MATERIAL		None required

8.7.5	POTENTIAL IMPACT	Noise
MITIGATION MEASURES		< Heavy vehicles and equipment (including mufflers) should be regularly inspected and maintained to ensure noise emission control systems are properly functioning; < To the extent possible, site preparation and construction activities should not be scheduled outside of normal working hours (8:00 am to 4:00 pm); < Avoid night-time work to the extent that is practical and; < Inform the residents along haul routes and at the respective project sites of noisy activities in the area.
ACTION BY		< Contractor's Manager to inform residents and implement work schedule < Contractor's Foreman to implement all other measures
TIMING		Residents to be informed of construction prior to the start of works. All other measures to occur during the construction phase.
SPECIALIZED EQUIPMENT OR MATERIAL		None required
SPECIALIZED COMPETENCE & TRAINING		None required
MONITORING/VERIFICATION		

8.7.5	POTENTIAL IMPACT	Noise
HOW / BY WHOM/, WHAT / WHERE/, FREQUENCY		< Noise levels to be measured at the nearest sensitive receptor by the Contractor' HSE Officer at least once per month during regular works, and compared with World Bank or other appropriate international standard. < Supervising Team's Environmental Inspector to inspect the contractor's site fortnightly and review monitoring records.
SPECIALIZED EQUIPMENT OR MATERIAL		Noise meter
COMPETENCE & TRAINING		Knowledge and experience in environmental noise monitoring

8.7.8	POTENTIAL IMPACT	Exhaust Emissions
MITIGATION MEASURES		< Contractor to properly service all vehicles and equipment to ensure that there are no visible sooty emissions. Defective vehicles should be taken out to service and should not be permitted to operate until they are repaired.
ACTION BY		< Contractor's Construction Supervisor to arrange for service of vehicles. < Contractor's Foremen to implement all other measures.
TIMING		< Vehicles and equipment to service as per manufacturers recommendations or sooner if excessive emissions are observed. < All other measures to be implemented throughout the construction phase.
SPECIALIZED EQUIPMENT OR MATERIAL		None required
SPECIALIZED COMPETENCE & TRAINING		Knowledge and experience in vehicle and equipment maintenance
MONITORING/VERIFICATION		
HOW / BY WHOM/, WHAT / WHERE/, FREQUENCY		▸ The Contractor's HSE Officer to conduct daily visual inspections of equipment and vehicles for sooty emissions at their respective sites. ▸ Supervising Engineer's Environmental Officer to inspect Contractor's site and activities fortnightly, and verify implementation of corrective and preventative actions.

8.7.8	POTENTIAL IMPACT	Exhaust Emissions
SPECIALIZED EQUIPMENT OR MATERIAL		None required

8.7.9	POTENTIAL IMPACT	Improper Solid Waste Disposal
MITIGATION MEASURES		< Limit clearing to areas required for construction. < Store cleared material away from drains. < Arrange for the regular removal of waste material from the respective construction sites by a Contractor for disposal at an approved landfill. Removal should be done as soon as practical to limit the time in which the waste material is stored on site.
ACTION BY		< The Contractor's Construction Manager to purchase the required waste receptacles. < The Construction Supervisor to arrange for the regular removal of waste
TIMING		< Provision of waste receptacles during construction. < The contents of these containers should be disposed of as needed.
SPECIALIZED EQUIPMENT OR MATERIAL		Separate secure containers for the collection of food waste and other debris.
SPECIALIZED COMPETENCE & TRAINING		None required
MONITORING/VERIFICATION		
HOW / BY WHOM/, WHAT / WHERE/, FREQUENCY		▸ The Contractor's HSE Officer will verify the acquisition of the required containers for keeping waste. He or she will inspect these receptacles daily during construction and maintain records of waste removal from site. ▸ Supervising Engineer's Environmental Officer to audit the Contractor's site and records once per fortnight as relates to solid waste.
SPECIALIZED EQUIPMENT OR MATERIAL		None required

8.8 Environmental Procedures for Post-Construction Phase

This Section presents the procedures for addressing environmental concerns during the post-construction phase.

8.8.1	POTENTIAL IMPACT	Impaired Water Quality
MITIGATION MEASURES		< Agrochemicals should be applied correctly, in accordance with instructions of product manuals and with the relevant regulations; < Mix pesticides and fertilizers on a containment pad to prevent runoff and to facilitate clean-up in the event of spillage; < Exercise caution in handling in order to prevent the spillage of agrochemicals; and < Utilize pesticides with relatively low toxicity, to the extent possible.
ACTION BY		Maintenance Contractor
TIMING		Post-Construction
SPECIALIZED EQUIPMENT OR MATERIAL		Low toxicity pesticides and agrochemicals
SPECIALIZED COMPETENCE & TRAINING		Knowledge and experience in the application of agrochemicals
MONITORING/VERIFICATION		
HOW / BY WHOM/, WHAT / WHERE/, FREQUENCY		▸ Representative of Ministry of Transport, Works, Urban Development and Local Government to supervise work as needed and review list of agrochemicals used onsite
SPECIALIZED EQUIPMENT OR MATERIAL		None

8.8.2	POTENTIAL IMPACT	Improper Solid Waste Disposal
MITIGATION MEASURES		< Regular cleaning of drains and rock traps as well as tree cutting and vegetative debris from bioengineering and erosion control measures.
ACTION BY		Maintenance Contractor
TIMING		Post-Construction
SPECIALIZED EQUIPMENT OR MATERIAL		None required
SPECIALIZED COMPETENCE & TRAINING		None required
MONITORING/VERIFICATION		
HOW / BY WHOM/, WHAT / WHERE/, FREQUENCY		▸ Representative of Ministry of Transport, Works, Urban Development and Local Government to inspect drains and debris twice per month
SPECIALIZED EQUIPMENT OR MATERIAL		None required

8.9 Summary of EMP

The table below provides a summary of the monitoring/verification required during construction and operation, and frequency at which they are recommended to occur.

Potential Impact	Parameter to be Monitored or Verification	Frequency of Monitoring
Construction Phase		
Slope Instability	Supervision of works by Contractor	Supervising Engineer whenever slopes are cut or as needed
Impaired Water Quality (due to hydrocarbons)	Visual inspections of vehicles and equipment, storage containers, refueling and maintenance areas for leaks, and for spills	Daily by contractor's HSE officer Fortnightly verification and review of records by the Environmental Inspector
Impaired Water Quality (concrete washings)	Visual inspections	Whenever concrete work takes place by Contractor's HSE Officer Fortnightly verification and review of records by the Environmental Inspector
Impaired Water Quality (improperly disposed solid waste)	Visual inspections	Daily by contractor's HSE officer Fortnightly verification and review of waste disposal records by the Environmental Inspector
Noise	Noise monitoring at nearest receptor	Once per month by Contractor' HSE Officer Fortnightly verification and review of records by the Environmental Inspector
Impaired Air Quality (exhaust emissions)	Visual inspections of equipment and vehicles for sooty emissions	Daily by contractor's HSE officer Fortnightly verification and review of inspection and maintenance records by the Environmental Inspector

Potential Impact	Parameter to be Monitored or Verification	Frequency of Monitoring
Solid Waste Disposal	Inspection of waste receptacles and housekeeping onsite	Daily by contractor's HSE officer Fortnightly verification and review of waste disposal records by the Environmental Inspector
Operation Phase		
Improperly Disposed Solid Waste	Visual inspection of drains	Twice per month by a Representative of the Ministry of Transport, Works, Urban Development and Local Government.