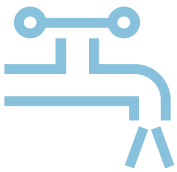


SAINT VINCENT AND THE GRENADINES

GROUNDWATER SOURCES AT HIGHER ELEVATIONS TO BE CONNECTED TO SANDY BAY AND OWIA SYSTEMS

REPORT 4 -Vol 1:

Environmental and Social Impact Assessment of Borehole Construction at Overland

V05

27/11/2023

CES

THE GOVERNMENT OF ST. VINCENT AND THE GRENADINES

THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

SAINT VINCENT AND THE GRENADINES

VOLCANIC ERUPTION EMERGENCY PROJECT

Groundwater sources at higher elevations to be connected to Sandy Bay and Owia systems

PROJECT REFERENCE: SVG-VEEP-CS-QCBS-2

REPORT 4-VOL 1:

Environmental and Social Impact Assessment of Borehole Construction at Overland

27/11/2023

V05

RECORDS OF REVISION

Version	Authors	Date
38341-Report4-Vol1-V00	CES Team: D.Heholt, M Monrose	31.07.2023
Revision	J. Espinosa, D. Gerstenkorn	
Submission V00		05.08.2023
38341-Report4-Vol1-V01	CES Team: D.Heholt, M Monrose	11.08.2023
Revision V01	J. Espinosa, D. Gerstenkorn	
Submission V01		14.08.2023
38341-Report4-Vol1-V02	CES Team: D.Heholt, M Monrose	21.09.2023
Revision V02	J. Espinosa, D. Gerstenkorn	
Submission V02		25.09.2023
38341-Report4-Vol1-V03	CES Team: D.Heholt, M Monrose	18.10.2023
Revision V03	J. Espinosa, D. Gerstenkorn	
Submission V03		22.10.2023
38341-Report 4-Vol2-V06	CES Team	17.11.2023
Revision V06	J. Espinosa, D. Gerstenkorn	
Submission V06		17.11.2023
38341-Report 4-Vol2-V07	CES Team	27.11.2023
Revision V07	J. Espinosa, D. Gerstenkorn	
Submission V07		27.11.2023

Table of Contents

List of Tables

List of Figures

ABBREVIATIONS

	"
AWWA	American Water Works Association
bgl	Below ground level
BH	Borehole
BRAGSA	Buildings Roads and General Services Authority
CHMP	Cultural Heritage Management Plan
Coc	Code of Conduct
CWSA	Central Water and Sewerage Authority
DTH	Down-the-hole-hammer
ECD	Eastern Caribbean Dollar
EHSGs	Environmental, Health, and Safety Guidelines
ESIA	Environmental and Social Impact Plan
ESCP	Environment and Social Commitment Plan
GRM	Grievance Redress Mechanism
LMP	Labour Management Plan
mamsl	Meters above mean sea level
MoFEPIT	Ministry of Finance, Economic Planning and Information Technology
NEMO	National Emergency Management Organization
NOAA	National Oceanic and Atmospheric Administration
OHS	Occupation Health and Safety
PAP	Project Affected Persons
PIU	Project Implementing Unit
PV	Photovoltaic
RAP	Resettlement Action Plan
RDM	Redress Mechanism
SEA	Sexual Exploitation and Abuse
SDS	Safety Data Sheet
SEP	Stakeholder Engagement Plan
SH	Sexual Harassment
SVG	Saint Vincent and the Grenadines
SWL	Static Water Level
USD	United States Dollar
UTM	Universal Transverse Mercator
VEEP	Volcanic Eruption Emergency Project
WB	World Bank
WSS	Water Supply System

1 EXECUTIVE SUMMARY

This Environmental and Social Impact Assessment (ESIA) for borehole construction represents part of the fourth report under scope of works of the lumpsum contract between the Government of Saint Vincent and the Grenadines and CES. The contract involves a number of specific tasks which also include design and supervision, of water supply improvement works to assist recovery efforts under the Volcanic Eruption Emergency Project (VEEP) following the eruption of the La Soufriere Volcano between December 2020 and April 2021.

The intakes and treatment system of the existing water supply systems of Fancy, Owia and Sandy Bay, which are supplied from surface (river) water sources situated on the slopes of the La Soufriere volcano, were damaged by the eruption. During moderate to heavy rainfall events, the thick layers of ash and pyroclastic material that were deposited on the slopes of the volcano are periodically washed into the supply river channels in the form of mudflows resulting in the blockages of intakes and high turbidity in the water supply from these sources. These contribute to frequent interruptions and closures to the water supply by the Central Water and Sewerage Authority (CWSA). This situation presents operational challenges for the CWSA with its engineering department being on constant alert for such occurrences and having to finance and manage repeated cycles of damage and restoration. Ground water is seen as one of the sources to be explored that may not be subjected to such vulnerabilities. CWSA's intention is to address these issues and ensure stable and sustainable supply to its consumers.

This ESIA focuses on the borehole construction and testing exercise to be conducted at Overland to determine the potential of ground water sources as part of the VEEP's subproject, the "Groundwater Sources at Higher Elevations to be Connected to Sandy Bay and Owia Systems". This project component has an expected duration of two weeks and the specific scope of works for the borehole construction is to be as follows:

a) The temporary installation of drilling and ancillary equipment including diesel generator, compressor pump, and temporary tents, portable illumination system, stores and sanitation facilities for the contractor's staff and all labor employed on the contract.
b) Drilling of production boreholes with min. 10" final drilling diameter.
c) Performance of well tests and aquifer tests.

The borehole component is to be part of the development of a water supply system using that ground water source at Overland to connect to the existing surface water systems at Sandy Bay and Owia. Overland has been given priority by the client.

While four sites were initially investigated, following further investigation, the Client was advised by CWSA to focus on the two lower Overland sites near the Windward Highway which were considered more feasible.

A separate Environmental and Social Impact Management Plan (ESMP) will be developed and presented to guide the proposed drilling works.

2 INTRODUCTION AND PROJECT BACKGROUND

On the 27th December, 2020 the La Soufriere volcano, located in the north of Saint Vincent and the Grenadines began an effusive eruption which on the 9th April of the next year 2021, became an explosive eruption. This continued until 22nd April after which volcanic activities remained low through to 27th April 2022

The northern half of the island (red hazard zone) was the most significantly affected and an evacuation order issued for all residents within the affected zone. The lahar flows from the volcano and subsequent heavily turbid and sedimented flows during heavy rainfall afterwards damaged the water catchment, treatment and distribution facilities in the area. This caused an interruption in the water supply for the area for a few months before a "makeshift" restoration could be accomplished between June and September 2021(CES Inception report 2023)

The Government of Saint Vincent and the Grenadines (GoSVG) received financing from the International Development Association (IDA, The World Bank) towards a Volcanic Eruption Emergency Project (VEEP) to support the recovery effort. The Project Development objective of the VEEP is to:

• provide short-term income support,

• improve the capacity of the government to prepare for and respond to emergencies, and

• build back better critical services in the aftermath of the La Soufriere volcano eruption.

The present project the "Groundwater Sources at Higher Elevations to be Connected to Sandy Bay and Owia Systems" is a subproject under the VEEP umbrella and includes:

1) the development of a water supply system using ground water source at Overland to connect to the existing surface water systems at Sandy Bay and Owia,

2) the improvement of water purification on the Perseverance water supply system

3) the improvement of the existing Fancy water supply system.

2.2 Overall Objectives of the Lump Sum Contract for the Design of VEEP Water Component

The Overall objective of this lump sum contract for the VEEP water project component has been highlighted in the inception Report and is as follows:

- Assessment, testing and design of well field at Overland to meet the required demand considering more than one well if necessary, using solar power system and their associated facilities.
- Review hydraulic design of the pump main and all distribution pipelines and storage.
- Design of a water treatment facility at Perseverance to increase capacity from 35 m3/h to a minimum of 70 m3/h and the proposed distribution extensions.
- Design of a new surface water intake structure at Fancy and water treatment facility with minimum capacity of 5 m3/h.

- Prepare Environmental and Social Impact Assessments (ESIAs), Environmental and Social Management Plans (ESMPs) and if needed, Resettlement Action Plans (RAPs), for all proposed facilities in accordance with Environmental and Social Management Framework (ESMF).
- Preparation of tender documents for procurement of works, services, material and equipment, as well provide technical support (for example evaluation of all bids, contract negotiations) to CWSA during the procurement process.
- Ensure that tender documents for procurement of works, duly incorporate and take into consideration the requirements (as applicable) of the Environmental and Social Standards (ESS) of the Environmental and Social Framework (ESF) of the Bank-this includes the provisions of the ESMF, Labor Management Procedures (LMP), RPF, SEP, and the Environmental and Social Commitment Plan (ESCP).
- Review, and ensure sure that relevant aspects of the ESCP and ESS documents are incorporated into the Environmental Social Health and Safety (ESHS) specifications of the procurement documents. Support with monitoring, to ensure that the consultants/contractors comply with the ESHS specifications of their respective contracts.
- Supervision of construction of the works contract.

2.3 Justification for Project Interventions

The following provides the justification for the proposed works to improve the water supply systems within the Fancy, Owia, Sandy Bay areas.

2.3.1 Fancy, Owia and Sandy Bay Water Supply Systems

Currently the three (3) existing water supply systems of Fancy, Owia and Sandy Bay are supplied from surface (river) water sources situated on the slopes of the La Soufriere volcano that recently erupted explosively in April 2021. These eruptions resulted in the destruction of intake and treatment structures in the rivers. The deposition of thick layers of ash and pyroclastic material that now sit on the slopes of the volcano covered the vegetation and soils, preventing percolation, with every moderate to heavy rainfall event, are periodically washed into the supply river channels in the form of mudflows. The consequence of every moderate to heavy rainfall event with the resulting mudflows is therefore an interruption of the water supply from these sources due to high turbidity, blockages, and closures. This situation presents operational challenges for the CWSA with its engineering department being on constant alert for heavy mudflows, and having to finance and manage repeated cycles of damage and restoration. CWSA's intention is to address these issues and ensure stable and sustainable supply to its consumers.

2.4 Scope of Works

It has been highlighted by Central Water and Sewerage Authority (CWSA) and the VEEP's PIU personnel that priority should be given to the Overland ground water pumping sites and the potential issues that may derive from there.

2.4.1 The Specific Scope of Borehole Construction for Overland Water Supply System

The specific scope of works for the borehole construction is as follows:

(a) The temporary installation of drilling and ancillary equipment including diesel generator, compressor pump, and temporary tents, portable illumination system, stores and sanitation facilities for the contractor's staff and all labor employed on the contract.

(b) Drilling of production boreholes with min. 10" final drilling diameter.

(c) Performance of well tests and aquifer tests.

CES's Report number 1 (Investigative reports and assessments of existing situation review. Draft designs for borehole(s) at Overland) along with Report number 2 (Final Design of Boreholes and Well Field at Overland) were submitted to and reviewed by the client. As communicated by the client, CWSA preferred option was initially a combination of Alternative 6 and Alternative 7 that were discussed in report No 1.

The combination of both options involves drilling one borehole at the higher elevation as described in alternative 7, and, depending on the results from the pump tests, if they are positive, drilling a second borehole in the same area. If the results are negative then drill two additional boreholes, one near the existing borehole and a second 120 m away from the existing borehole. The results of the drilling and pumping tests at the higher elevation would determine if a total of 2 or 3 boreholes would need to be drilled.

However, difficulties found when trying to conduct geophysical investigations to site the boreholes at higher elevations lead CWSA to adopt the option corresponding to the Alternative 6 in report number 1.

2.5 Impact of other key projects on this project

This project involves attention to ensuring proper and secure river crossings by water mains including crossings that run along bridges to accomplish this purpose. During consultation with the VEEP team it was highlighted that another project, the Design of the Permanent Bridges at London, Noel and Overland project where temporary Bailey bridges are located, might have an impact on this project being presently undertaken (Meeting with VEEP staff 12 July 2023, and Research). Trintoplan Consultants Limited of Trinidad and Tobago has been awarded the design contract for the permanent bridges at Noel, Overland and London and are expected to be the supervising firm once the construction of these structures commences. The design phase may last up to 12 months and the cost of each bridge may be more than EC$4 million.[1]

This project's scope involves the laying and crossing of pipelines where Trintoplan's bridge projects are to be constructed and as such to the need for both projects to coordinate and address potential cost, schedule and implementation implications for both projects. There must be an understanding of the designs under both projects in order to minimize potential delays or escalation of associated cost as a result of any conflicts in either projects construction works.

[1] Local Newpapers highlighted this upcoming project. (https://www.**stvincenttimes**.com/trinidad-firm-to-design-3-new-permanent-bridges-for-north-windward/); (https://**thevincentian**.com/temporary-bridges-opened-p26365-1.htm)

An introductory discussion was held with representatives of the company and it's sub consultants and it was strongly agreed and supported that the project managers and designers for this project and the Trintoplan designers and project managers must liaise to have a clear understanding of each other's project design, scopes, implications for timelines, and implementation[2]. This would assist in avoiding the cost of remediation or duplication of efforts, for example at Overland with the boreholes where placing of a water pipeline along the baily bridge would later have to be removed to accommodate the construction of the new bridge and the reinstallation of a pipeline in the appropriate location. This all requires careful planning and a joint approach as the designing of the new bridges may actually affect the design and the timeline for the implementation of the CES's project deliverables because of the period of the Trintoplan design phase and consideration of the priority and urgency being given to the Overland well field.

2.6 Methodology

The general methodology used to prepare this ESIA was one of literature review of pertinent documentation, site visits, direct interviews and consultation with key stakeholders such as the design consultants, the Central Water Authority, key officials, and farmers on site were conducted. Potential environmental impacts and possible mitigative measures were determined from scoping exercises and a rapid assessment during the visits to the specific project sites. The site visits were conducted on the 6th and 13th of July and consultations between the 6th and 21st of July 2023.

This ESIA report has been guided by the requirements of the World Bank and documentation provided by the VEEP. These guiding documents are the World Bank Environmental and Social Standards (ESS) as well as the VEEP Environment and Social Commitment Plan (ESCP) and Stakeholder Engagement Plan.

Data collected through consultations with relevant stakeholders and data collected by the Design Consultant during fieldwork for preparation of the preliminary and final designs was of great assistance.

A separate Environmental and Social Management Plan (ESMP) will be presented with measures to guide the contracted works and which is to be monitored to ensure compliance.

The site photos during this exercise are presented in Annex 3 Site Photos for reference.

2.7 Reporting

The Environmental and Social impact Assessments (ESIAs) and Environmental and Social Management Plans (ESMPs) represent the fourth deliverable report for the lump-sum contract between the Government of St Vincent and The Grenadines and CES Consulting Engineers Salzgitter GmbH under the Volcanic Eruption Emergency Project (VEEP) - Design and Supervision Consultancy for the North Winward Water Supply (Saint Vincent). This particular report is labeled Volume 1 because it focuses on Overland well field while the next ESIA under this Report 4 will focus on the other works to be undertaken and labeled as another volume.

[2] An introductory online meeting was held with representatives of Trintoplan the engineering design company, EcoEngineering and Kairi the environmental and the social consulting firms respectively, do discuss introductoru scopes and progress. A formal detailed meeting is to be held at some point between CES's and Trintoplan's Project leaders.

3 POLICY, LEGISLATIVE AND INSTITUTIONAL FRAMEWORK

It is expected that the contractor and or any sub-contractor employed on the project shall avail themselves and comply with all current relevant legislation and regulations, including environmental legislation of St Vincent and the Grenadines. Ensuring knowledge of the laws must be undertaken prior to commencement of the project work.

3.1 Agencies, Legislation and Responsibilities

Table 1 below provides a matrix outlining the main agencies, guiding legislation, and their responsibilities within the context of this project.

Table 1 Matrix of Agencies, Legislation and Responsibilities

Agency	Legislation	Responsibility
CWSA- The Central Water and Sewerage Authority	Central Water and Sewerage Authority Act No. 17 of 1991 as amended last by Act No. 38 of 2007. . Central Water and Sewerage Authority (Water Supply) Regulations, 1991 (S.R O No. 29 of 1991). 1991-11-22 . Central Water and Sewerage Authority (Sewerage) Regulations, 1991 (S.R O No. 30 of 1991). 1991-11-22	The CWSA has a broad-based management responsibility for the management of water resources within Saint Vincent. It manages the island's water catchments on mainland St Vincent and is responsible for the provision, operation, and maintenance of the island's water catchment, treatment, and distribution networks. The company ensures that water quality is in compliance with the World Health Organization drinking water quality standards.
Ministry of Transport, Works, Lands and Surveys, and Physical Planning	Roads Act Cap 357 of 1956 Town and Country Planning Act (No.45 of 1992)	The Ministry is the chief technical Ministry and has responsibility for all public works within the country. It has the mandate to develop and maintain national road infrastructure in SVG. Oversees the major programmes of rehabilitation, re-building and construction of roads, bridges, and associated drains. The Town and Country Planning Act (No.45, 1992) guides orderly development and planning in SVG. Under this act, Physical Planning has the legal authority to grant approvals to applications for development, and for environmental management in general, including the

		evaluation of the need for, request for, and level of EIA required.
BRAGSA - The Building, Roads, and General Services Authority	The St. Vincent and the Grenadines Roads Buildings and General Services Act No.23 of 2008	This agency has responsibility for the maintenance and upkeep of all public infrastructure within SVG.
Ministry of Agriculture, Forestry, Fisheries, Rural Transformation, Industry and Labor	Fisheries Act (No.8, 1986), & later amendments (No.32, 1986, and No.25, 1989) · Forest Resource Conservation Act (No.47, 1992 Marine Parks Authority Act1997(No.33, 2002) · Natural Forest Resource Act (1947) · Wildlife Protection Act (No.16, 1987) & later amendments (1988, 1991) · Wildlife Conservation Act (1991)	This Ministry is responsible for all agricultural and related matters in SVG. It promotes and manages national agricultural activities, fisheries, forestry and attendant matters. It provides for the conservation, management and proper use of the forest and watersheds, declaration of forest reserves, cooperative forest and conservation areas, the protection of wildlife, the establishment of Marine Parks and related matters related to fisheries.
Solid Waste Management Unit under the Solid Waste Management Authority	Waste Management Act. No.31 of 2000 Litter Act No.15 of 1991	The SWMU initially established in November, 1999 to execute the activities under the “Organization of Eastern Caribbean States (OECS) Solid and Ship-generated Waste Management Project” is run under the CWSA who is also the Solid Waste Management Authority. It is responsible for the collection and disposal of solid waste, the development of waste management facilities, collection and

		disposal of residential, commercial, industrial and institutional garbage in SVG.
Ministry of Health, Wellness and the Environment	· Environmental Health Services Act (No.14, 1991) · Environmental Impact Assessment Regulations (Draft, 2009) · Environmental Management Act (Draft, 2009)	The Ministry makes provision for the conservation and maintenance of the environment in the interest of health generally, and in particularly in relation to places frequented by the public. There is an Environmental management unit that addresses matters of sustainable management and international agreements and conventions.
Department of Labour	·The Factories Act Chapter 335 of 1955 (amended 1987) ·Accidents and Occupational Diseases (Notification) Act, 1952 ·Wages Councils Act, 1953: ·Trade Unions Act, 1950: ·Trade Disputes (Arbitration and Inquiry) Act, 1940: ·The Equal Pay Act of 1994 ·The Employment of Women, Young Persons and Children Act of 1990 ·St. Vincent and the Grenadines Occupational Safety and Health Act, 2017 (not ratified)	The Department of Labour resides under the Ministry of Agriculture, Forestry, Fisheries, Rural Transformation, Industry & Labour. This Department has responsibility for ensuring the health and safety measures for workers in SVG and addressing such matters working hours, working conditions, investigating complaints and payment of arrears, enforcement of wages regulation orders and all associated issues, employment of women, young persons and children, occupational injuries due to all types of occupational accidents, occupational health and safety inspections and reporting.

National Emergency Management Organization (NEMO)	National Emergency Management Organization Act 2006	The National Emergency Management Organization is responsible for the management of all disaster-related activities in the country. NEMO under their Act governs the prevention, preparedness, response, mitigation and recovery regarding hazards, disasters and emergencies.
Saint Vincent and the Grenadines National Trust	Saint Vincent and the Grenadines National Trust Act, 1969 (Cap.329)	The Trust has the general responsibility for national patrimony, to manage certain protected areas, provide public education related to natural and historical assets, conserve areas of natural beauty, buildings and other assets of archeological, architectural, artistic, historic, scientific, or cultural interest
St. Vincent and the Grenadines Electricity Services Limited (VINLEC)	The Electricity Supply Act 1973	The St. Vincent and the Grenadines Electricity Services Limited, VINLEC has the exclusive license for the national electricity supply.
Govt of SVG	National Energy Policy 2009	the National Energy Policy 2009 promotes and adopts the sustainable use, management and conservation of energy at the national level. It provides the principles for reducing the national dependency on imported fossil fuels, stabilizing and reducing the per capita energy consumption, and assessing alternative energy sources in the medium and long term. It also manages the expanded exploitation of indigenous resources to reduce the dependence on imported energy and improve the national energy efficiency and conservation of energy use.

The Ministry of Transport, Works, Lands and Surveys, and Physical Planning has the legislated responsibility for all public road infrastructure within St. Vincent and the Grenadines. The Ministry itself manages or oversees the major programs of rehabilitation, re-building and construction of roads, bridges, and associated drains, which are actually executed by private contractors.

The Building, Roads, and General Services Authority (BRAGSA) is the state agency responsible for maintenance of roads which includes carrying out basic road repairs and road-cleaning, as well as limited construction through contractors when required. Road repairs, rehabilitation, or construction is affected principally though the Ministry of Transport and Works with that Ministry providing technical supervision of construction works.

While the Town Planning Division now of the Ministry of Transport, Works, Lands and Surveys, and Physical Planning, is responsible for granting approval or planning permission for development within the country, the fact remains that capital projects such as the water supply pipeline system does not go before the Planning Board but is executed by CWSA in the national interest.

The Physical Planning is also the legal authority for environmental management and determines if an Environmental Impact Assessment (Section 29) is required for the proposed development. An Environmental Impact Assessment Regulation, presently in a draft, is supposed to further support the Act, stipulating the need for an Environmental Impact Assessment (EIA) based on the project's planning application review outcome. The Regulation is to also outline the Terms of Reference to guide the process based on the screening exercise results.

While Physical Planning under the planning Act may require the production of EIAs, projects such as the water supply projects generally tend to be constructed without such consideration unless it is a donor agency requirement or there is a directive from the Planning Board. This should not preclude Physical Planning from reviewing such works even while providing an acknowledgement that permits/reviews for such are not required.

The Ministry of Health, Wellness and the Environment, under the Environmental Health Services Act, No. 14 of 1991, governs the conservation and maintenance of the environment in the interest of general public health and highlights the responsibility of such to belong to the Ministry of Health and the Environment. The Act stipulates the responsibility of the Ministry for the regulation, monitoring and controlling of present and likely environmental pollution along with the investigation, prevention and remediation of environmental pollution.

While CWSA will be undertaking their water works, such as this borehole exercise and does not require approval from Planning or the Ministry of Transport, it is expected that their contractor will abide by all planning, public health and environmental requirements. The public health officers within the zones where the works will be occurring, as part of their routine zonal monitoring can intervene and enforce the regulations or requirements where there may be a breach by the ongoing works.

In the absence of some environmental regulations or guidelines for pipeline projects, the management of what may be considered environmental impacts is largely left to the contractor guided by the relevant environmental management clauses within his contract, Monitoring and supervision is to be undertaken by the responsible Ministry. (Interview with Physical Planner C. Phillips 18&20 July 2023).

3.3 World Bank Requirements

The VEEP and its subprojects are World Bank funded projects. These projects are guided by the World Bank Environmental and Social Framework (ESF) which are designed to ensure that the projects are economically, financially, socially, and environmentally sound.[3]

3.3.1 World Bank Environmental and Social Framework Performance Standards

World Bank Environmental and Social Framework Performance standards have been established within the World Bank Environmental and Social Framework (ESF) regarding the evaluation and management of the environmental and social impacts of the projects they finance. To better manage the environmental and social risks of the projects, the World Bank has determined the following Environmental and Social Standards (ESS) to guide this project. Refer to table 2 below.

Table 2 Performance Standards to Guide Project Environmental and Social Standards (ESS) Description and Objectives

Environmental and Social Standards (ESS)	Description and Objectives
ESS1 - Assessment and Management of Environmental and Social Risks and Impacts	ESS1 sets out responsibilities to assess, manage and monitor environmental and social risks and impacts associated with each project phase.
ESS2 - Labour and Working Conditions	ESS2 describes the importance of creating employment and income for comprehensive financial development and poverty reduction. It promotes safety and health at work, fair treatment and non discrimination of project workers and the prevention of forced and child labour.
ESS3 - Resource Efficiency and Pollution Prevention and Management	ESS3 refers to resource efficiency, pollution prevention and pollution management requirements, it promotes the sustainable use of resources, including energy, water and raw materials and the avoidance or minimizing of the adverse impacts of pollution from project activities and pesticide use.
ESS4 - Community Health and Safety	ESS4 addresses the health, safety, and security risks and impacts on project-affected communities, with particular attention to people who may be vulnerable. ESS5 - Land Acquisition, Restrictions on Land Use and Involuntary Resettlement

[3] World Bank Environmental and Social Framework- ESFFramework (2).pdf
- https://www.worldbank.org/en/projects-operations/environmental-and-social-framework
https://thedocs.worldbank.org/en/doc/837721522762050108-0290022018/original/ESFFramework.pdf
World Bank Environmental and Social Standards- https://www.worldbank.org/en/projects-operations/environmental-and-social-framework/brief/environmental-and-social-standards

ESS5 - Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	addresses land acquisition, restrictions on land use and involuntary resettlement to avoid forced eviction; mitigate and compensate for unavoidable adverse social and economic impacts from land acquisition or restrictions on land; and compensation or assistance to improve or restore the standards of living or livelihoods for project affected parties (PAPs) impacted by the loss of assets including crops and trees.
ESS6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources	ESS6 requires the conservation and preservation of natural resources. It promotes the sustainable management of living natural resources and supports the livelihood of local communities and inclusive economic development by adopting practices that integrate conservation needs and development priorities.
ESS8 - Cultural Heritage	ESS8 sets out general provisions on risks and impacts on cultural heritage from project activities. To protect cultural heritage from the adverse impacts of project activities and support its preservation. ESS8 also addresses the procedure for chance finds.
ESS10 - Stakeholder Engagement and Information Disclosure.	ESS10 emphasizes the importance of open and transparent participation between the client and stakeholders throughout the project life-cycle. It 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. ESS10 also ensures that project-affected parties (PAPs) have accessibility and inclusive means to raise issues and grievances and allow the client to respond to and manage such grievances through the Grievance Redress Mechanism (GRM).

3.4 Standards and Guidelines

The following Standards and Guidelines are to be Followed for the project:

3.4.1 Environmental and Social

The overarching environmental and social standards for the project will be guided by the World Bank Environmental and Social Standards (ESS).

The following documents will also provide guidance on the environmental and social requirements of the project works and interactions:

1. Environment and Social Commitment Plan (ESCP)

2. Stakeholder Engagement Plan (SEP)

3. Environmental and Social Management Framework (ESMF)

4. Labor Management Procedures (LMP)

5. Environmental, Health, and Safety Guidelines[4]

3.4.2 Borehole and General Water Works

The borehole exercise and the project water work specifications and practices are to be guided by the latest published versions of the following standards and codes.

- ASTM Standard Test Method for Withdrawal And Injection Well Tests For Determining Hydraulic Properties Of Aquifer Systems (D4050-960)
- AWWA Standard for Water Wells (A100- 97)

3.4.3 General Work Standards

The following will guide the general design and construction of related project works:

The design and construction of all main structures in reinforced concrete and all concrete works will be guided by the BS EN 1992 (Eurocode2) -1,2&3 (The Structural use of Concrete) Concrete works, and BS EN 1992 (EC2). The ACI 318- 95 Building Code Requirements for Structural Concrete and other American standards will also be permitted provided that the conditions of high environmental aggressiveness for "corrosion protection of reinforcement" for a useful life of 50 (fifty) years are obeyed. (TORs section 4 pg 89)

According to the Terms of Reference guiding these proposed project works, all materials, components and accessories to be utilized must comply with the latest revisions to the standards mentioned below, as applicable. Other standards will be accepted if they are internationally recognized and previously approved by the CWSA. As alternatives to the BS EN 1992 and AWWA Standards, the standards of the following entities will be considered (TORS Section 4, pg 89):

- DIN Deutsche Institut für Normung
- AISC American Institute of Steel Construction
- AWS American Welding Society
- AISE Association of Iron and Steel Engineers
- ANSI American National Standards Institute
- AISE Association of Iron and Steel Engineers
- ASME American Society of Mechanical Engineers
- JIS Japanese Industrial Standard

[4] World Bank Environmental, Health, and Safety Guidelines cover general areas such as Environmental, Occupational Health and Safety, Community Health and Safety, Construction and Decommissioning. These Guidelines guide local project EHSGs and can be found at https://www.ifc.org/en/insights-reports/2000/general-environmental-health-and-safety-guidelines)'

- FEM Federation Europeenne de la Maintenance
- AGMA American Gear Manufacturers Association
- NEMA National Electrical Manufacturers Association NEC National Electrical Code
- EEI Edison Electric Institute.
- ISA The Instrumentation, System and Automation Society

3.4.4 Additional Standards and Guidelines

All applicable local standards or legislated regulations or any permitting conditions will apply and guide the project's works.

4 OVERLAND WELLFIELD

4.1 Sub Project Details

The Overland area has been identified for the location of the pump tests as highlighted above. The proposed duration for the work to be undertaken is two weeks. There is an existing observation borehole on the site at Overland Magnum which has been used for preliminary testing. The proposed method of drilling and siting the boreholes have been detailed in Report no 2-Final Design of Boreholes and Well Field at Overland which was already provided to the client. Figure 1 below depicts the locations of the proposed boreholes, and these are identified as BH C to D for reference.

Figure 1 Locations of proposed boreholes at Overland.

4.2 Site Specifics

4.2.1 Borehole BH-C. Low Overland

This potential site is located to the west across the Windward Highway across approximately 120m from the exiting sealed borehole. Refer to **ANNEX** Photo for pictures of the site.

4.2.1.1 Access

Access to the site is open and easily off the main east coast highway.

4.2.1.2 Topography

Generally flat with a noticeable depression.

4.2.1.3 Exiting and Surrounding Land Use

This site is vacant and was previously cleared to facilitate initial well exploration. The most significant surrounding land use is residential in the form of the Overland community across the riverbed to the north which is accessed via the highway and over an existing Bailey bridge.

4.2.1.4 Vegetative Cover

This site is covered in secondary shrub growth with grasses and wild flowering shrubbery that has begun to reclaim the area.

4.2.1.5 Services

Electricity and water exist nearby.

4.2.1.6 Flora and Fauna

There were no endemics identified.

4.2.2 Borehole BH-D. Low Overland

This site is located east just off the Windward Highway in an open flat area within the vicinity of the existing borehole that was previously utilized for exploration and is now caped with metal casing extended out of the ground and fenced. The Tourama River, dry riverbed, is in close proximity bordering this site to the north. To the immediate south and west it is bordered by the existing highway. The east contains more flat sandy lands with secondary vegetation. Refer to ANNEX Photo for pictures of the site.

4.2.2.1 Access

Access to the site is open and easily off the main Windward Highway.

4.2.2.2 Topography

Site is flat.

4.2.2.3 Exiting and Surrounding Land Use

This site is vacant and was previously cleared to facilitate initial well exploration and so a capped borehole presently exists there. The most significant surrounding land use is residential in the form of the Overland community across the riverbed to the north which is accessed via the highway and over an existing Bailey bridge.

4.2.2.4 Vegetation Cover

There is secondary shrub growth with grasses and wild flowering shrubbery has begun to reclaim the area.

4.2.2.5 Services

Electricity and water exist nearby.

4.2.2.6 Flora and Fauna

There were no endemics identified.

4.3 Drilling Scenarios

Both wells (BH-C and BH-D) will be drilled in the vicinity of the existing Overland borehole beside the Windward Highway (estimated drilling depth of each well approx. 30 m bgl).

4.4 Geology of Site

The geology of the area is characterized by deposits of scoria (volcanic sand and gravel), building up the walls of the riverbed and - at the Overland borehole drilling site - the underground to a depth of about 20 m below ground level. Deeper layers consist of basaltic lava and/or andesites which are quite probable fractured and filled with alteration products in the upper zone. The borehole log has not shown deposits of impermeable or less permeable layers as clay or silt so that the hydraulic conditions show a good groundwater potential in the area. The ridges between the rivers will be investigated by geophysical methods to rule out that basalt ridges interrupt the aquifer laterally as there are elevations of volcanic material on the ridges. The area through which the neighboring rivers flow probably forms a coherent aquifer, but there is no proof due to the lack of observation opportunities. The average static level of the Overland observation borehole is about 15.5 m bgl (1.5 m amsl).

4.5 General Methodology of Works

4.5.1 Drilling Method

A general summary of the more detailed methodology for the drilling exercise outlined in CES's Report 2 is summarized here and will involve the following. The client/engineer will mark out the drilling sites on ground for the drilling contractor. The selection of the sites allows for ease of accessibility and outside of potential flooded areas. Drilling and well construction with the appropriately sized rig will commence with the contractor and project engineer communicating on key matters pertaining to the exercise from commencement, well development, protection of the boreholes, logging of information, care and protection, measurements, filter gravel, drilling mud, to final decommissioning and restoration of the sites as outlined in the above mentioned report.

The anticipated drilling method will be rotary drilling with 10 – 12" diameter (e.g., with a step bit) in the sedimentary or weathered overburden. Upon encountering the underlying hard rock and for the insertion of a temporary steel protection casing, the most adapted drilling method DTH (down-the-hole-hammer) for a (final) drilling diameter of 10" may be utilized.

The Contractor is expected to provide for his own supply of water for drilling and development operations. He is also required to take maximum care to avoid any physical, chemical, or biological contamination of the borehole or well water during construction and testing. Biodegradable mud is proposed for stabilizing the inside walls of the bore hole.

Upon completion of the works, the Contractor is to remove all cuttings, debris and unused materials and restore the site as near to its original condition as reasonably possible. The Engineer will approve whether the site has been restored to an acceptable standard.

If for some reason the Contractor is not able to finish the drilling or has to abandon a well due to loss of tools or any other accident or contingency, any temporary casing or drilling rod is to be removed from the hole. The hole is then refilled with clay, concrete, or any other impervious material.

4.5.2 Production Wells

Production wells boreholes is to be drilled with a minimum diameter of 10" to the final depth with drilling depth guided by the project engineer. The aim is to catch the water bearing overburden and the fractured or thrusted zones of the underlying hard rock (basalt lava or andesites) with an exploitable yield of at least 40 m^3/h. Drilling depths might exceed 70 m in relation to the topography and where necessary or where the Engineer decides to explore deeper layers. The final drilling bore are not to be less than approx. 10" and not more than 12". PVC-casing and screens with 8" internal diameter of approved quality are to be installed. (Report No2. Sectn 2)

In order to control growth of bacteria introduced into the well during the works 1 kg of sodium hypochlorite should be added to every m^3 of water in the well before test pumping. The solution shall remain at least 6 hours in the well before being pumped out. Evacuation of the chemicals shall be done during test pumping.

4.5.3 Water Sampling and Analysis

The water withdrawn from the well during the operation is to be channeled by lined channel or pipe at least 50 m from the well to a site where it will flow off without affecting the well.

Discharge, water levels and quality is to be continuously be monitored and **test water samples** will be sent to an approved laboratory for analysis. The parameters to be analyzed are: Temperature, pH, EC, Turbidity, M-Alkalinity, Total Hardness, TDS, Na+ , K+ , Mg+2, Ca+2, SO4-2 , Cl - NO3- , NO2- , NH4+ , Total Iron, Total Manganese and Total coliforms. Analysis is also to be conducted for Arsenic in the discharge waters over time as well.

Upon completion of the production wells, the boreholes are to be closed by a concrete slab of 1.2 x 1.2 m and a height of 0.5 m with a foundation depth of 0.3 to 0.4 m. This is to cover the annulus and the surface casing, encompasses, and will anchor the steel well head. A layer of lean concrete is to be placed before casting the slab. A steel well head will cover the well casing and serve as a link between riser pipe and the well elbow. The well head must be tight and capable of taking the load of riser pipes and pump and provide for a number of access openings to facilitate monitoring or observation purposes.

4.5.4 Demobilization of the sites

Demobilization which would comprises the complete reversion of the mobilization activities including removal of the drilling rig to its home or base site and must include the removal of all debris and materials which includes any garbage and waste oils or mud., and the restoration of the premises used for the base camp as well as for any other temporary facilities the Contractor chooses to establish.

4.6 Sustainable Energy Usage

4.6.1 Photovoltaic Power Supply System for Overland Well

CWSA has managed to keep tariffs low and minimize debt in its operations, The benefits of such must continue to be reflected in the service and costs to its customers (consultation with CWSA tech staff). In In Section 4 of Report 2, the matter of net zero operational or energy cost increase has been highlighted and is considered a sustainable and acceptable option of operation. A “buy all, sell all” approach is proposed for the power supply considerations for the operation of the wells at Overland as the most favorable option for energy supply. It would appear based on initial research by CES, the most favorable option with regards to photovoltaic power generation for electricity supply to Overland is the “buy all, sell all” option where the CWSA would buy from VINLEC (the grid electricity provider) all the electrical energy consumed in Overland Well Field and would sell to VINLEC all the electricity generated by a new PV solar power supply system to be constructed in the acquired land at Overland.

This option will require that whatever is the final site of the production boreholes the electrical installation should be tied into the electric grid. Regardless of which site is chosen for the production wells, the PV system will be placed at the original site where the power generated will be sold in order to have net zero energy for operations.

Based on the different prices commonly rated by VINLEC for buying PV-generated electricity (0.45 ECD/kWh) and for selling electricity from the grid (1.15 ECD/kWh), and taking into account that the motor rated power of submersible pumps with a 20-25 m3/h at 144 m capacity is around 15 kW and two of them together with the other electrical consumers of Overland Well Field would consume from the grid 534kWh daily to meet the foreseen 660-m3/day water demand for Overland Water Supply system.

After a revision of preliminary assessments in previous versions of the present report, it has been estimated that a grid-tied PV solar power supply system of a solar array rated 347 kWp (instead of 322 kWp previously assessed), with an area of around 2,000 m^2 to install 800 panels, each one occupying an space of 2 m^2, will be required. Implementation costs roughly estimated in ECD 2,500,000, would be sufficient to compensate the cost of energy consumption from the grid.

4.7 Identification of the Chosen or Final Sites for the Borehole Exercise

During the month of August, CWSA determined a number of issues which included potential social and legal issues with the initially selected upland location A in the upper Overland area. The area of the subsistence farming activity had increased and with an intention to increase further. There was an unwillingness by the farmer to accommodate the requirements for the project in that area. Technically, CWSA had concerns in regard to the accuracy of any resistivity to be done in that area which geographically is between two rivers and would influence the results. These factors contributed to the determination that such issues made it prohibitive to undertake any works there. Upon further investigation, the Client was advised by CWSA to focus on the lower Overland sites where there would be the two wells and adjusting abstraction rates there over time would reduce saltwater intrusion, which was determined as an issue. The final sites for the borehole work at Overland going forward have now been identified as sites C and D in the lower area (Refer sites in Figure 1 above).

5 ENVIRONMENTAL IMPACTS

5.1 Potential Environmental Impacts

The following environmental impacts were determined based largely on the scoping exercise during the site visits, research, the various consultations including CES and CWSA technical leads, and consideration of the proposed design. In the event that there are any additions or revisions to this wellfield design that raise any additional impacts, then these will be considered and appropriate mitigative measures outlined. The impacts identified below are not considered long term and are considered manageable.

5.1.1 Loss of Vegetation Cover

At BHC, there is more of an extent of sand and then some covering of scrub vines and secondary growth which will need to be removed.

The area around BHD is a mix of scrub, secondary growth and fruit trees. The impact of the covering vegetation, especially within the higher sites, is the general loss of cover and root material that assists with soil stabilization and reducing erosion. With heavy rainfall, those lands are prone to erosion and contribute to sedimented runoff and potential land slippage. The possibility of erosion and slippage at sites C and D are lower from rainfall. In all cases the potential for erosion increases when drilling and pumping begins and any water from the wells spreads uncontrollably onto the landscape.

The practice of grubbing and deforesting or removal of vegetation for exploratory and for site preparation and construction works can mean the removal of deep-rooted vegetation that assist with soil and slope stabilization. In this case in lower Overland, the sites are adjacent to the banks of the Tourama river and in upper Overland, they are close to the cliff edges over the Tourama and the God Save the Queen Rivers. Care must be exercised. The removal of the roots and canopy cover that protects exposed soils, especially those of a sandier nature as exist within the sites, can lead to land slippage, erosion, and contribute to sedimentation of the river when it is flowing. The increased sedimentation can lead to increased turbidity levels within the rivers and along the coastline, impacting aquatic communities during heavy rainfall. A heavy blockage of the river mouth, which is a low probability from this project, may contribute to increased downstream flood potential. The natural vegetation also plays an important part in maintaining soil moisture content and overall health of the ecosystem along the river. The removal of the vegetative cover also has the potential to lead to the loss of habitat for any endemic flora and fauna as well as a loss of biodiversity who depend on the vegetation for food, shelter, and procreation. Particular care must be exercised to minimize any unnecessary removal of vegetation, particularly of any mature trees on slopes or near the cliff edges or river banks during works.

5.1.2 Biodiversity/ Species Disturbance and Loss

The modified or secondary vegetation within the proposed sites, particularly the fruit trees serve as food sources and nesting habitats for any species rearing, and their protection. During the site visit there appeared to be no abundance of lush vegetation or presence of any particularly special terrestrial flora or fauna on the sites.

None the less, it must be noted that the generation of noise from the construction activities and drilling operation can disturb any existing fauna species, temporarily causing disorientation and temporary vacation of what has been a safe and accommodating habitat. This is particularly significant during the nesting and rearing periods of the year and care will need to be exercised in that respect. Similarly, any fumes from any machinery, or the burning of waste material on site will also be disruptive. However, upon decommissioning and restoration of the sites, it is expected that both flora and fauna will re habitate the areas.

5.1.3 Poor Soil and Water Quality

There is the risk that construction activities (site preparation, drilling and general construction works) negatively impact the existing soil and water quality of Tourama River in the last 200 meters. Any loose or disturbed soil as a result of the construction activities, if not appropriately managed, may end up in the river and contribute to poor water quality during a heavy rainfall event. This would include works involved in site clearing, stripping and stockpiling of the topsoil/organic layer, loose construction material such as

cement and fines, excavation, backfilling operations to modify to existing slopes and grades to accommodate access and work areas. Materials such as concrete with sand and cement being handled within close proximity and can leach directly into the riverbed. The indiscriminate disposal of construction waste materials which would include cement bags, or other materials such as damaged formwork, can contribute to pollution unless properly contained. Adequate management of solid and liquid wastes is a key issue. However, with heavy rainfall, waters will already be very turbid with little scope for use and so the impact on the river itself may not be considered significant.

The indiscriminate and improperly managed use and disposal of oils, lubricants, or chemicals used in the drilling process (eg bentonite) in contravention to their manufacture or (safety data sheet) SDS instructions, machinery, for any servicing, and in the construction process can contribute to both soil and surface water pollution. Drilling fluid (especially with rotary drilling) could contain additives which are harmful to the environment. During rainfall events chemicals can mix or be carried with runoff and create liquid wastes that coat and impact the soils as well as impact the marine environment. The management of any wastewater, and in particular the possible disposal human waste on or near the site is very critical to ensuring a healthy working environment and reducing the risk of fecal contamination of the immediate or nearby surrounding environment. The contractor will be responsible for providing adequate sanitary facilities. Appropriate measures such as monitoring and the implementation of catch basins or silt traps, proper solid and liquid waste and chemical use management is critical.

5.1.4 Increased Noise and Vibration Levels

Increased noise and vibration levels through construction activities such as the movement of heavy construction and supply trucks into and out of the site, and the operation of machinery such as excavators can have negative impacts on the existing terrestrial and marine environments, particularly within this generally quiet, lowlying area. In secluded or heavily vegetated riverbanks, fauna habitats can be disturbed causing creatures as birds and amphibians to flee their homes and nesting areas.

Similarly, increased noise levels from activities adjacent to or within the communities such as the movement of equipment or large trucks transporting materials, may be deemed as an unnecessary and unwanted nuisance affecting day to day activities. Associated vibrations from the use of heavy equipment such as rollers or excavators can negatively impact surrounding communities by causing nuisances through the shaking of households and household items, and possibly affecting the stability of these structures if they were not properly constructed. Similarly, for biological communities, mating seasons may be affected depending on the time of year that the project activities commence.

It is anticipated that there will be vibration and noise impact to the Overland community. These will derive largely from any excavation works, transporting construction and well equipment and parts. These are considered occasional levels of impact. The drilling operation will provide prolonged noise and vibration to the immediate surrounding area throughout the workday. The intensities will be dependent on the construction activity being undertaken and on a longer basis, the drilling equipment being used at that time.

The most directly impacted would be the works and equipment operators who must be provided with the appropriate PPE and breaks to manage those impacts and all pertinent local and international occupational health and safety requirements and regulations must be applied.

However, while it is expected by the consultant that noise and vibration levels are expected to be and manageable, care must be taken in the judicious usage of any form of heavy noise and vibration generating equipment.

5.1.5 Poor Air Quality / Pollution

Poor air quality can originate from several sources related to the project and can be a potential nuisance to the community and to motorists. The potential exists for impacts on the communities through which the construction vehicles pass through and especially for motorists and their passengers or pedestrians who will be directly affected by the project works.

The vehicles and machinery being utilized for the project can produce noxious fumes such as carbon monoxide, diesel fumes, as well as burnt oil fumes with hydrocarbon and other substances. There is also the increased potential for air pollution to emanate from the operation of older or improperly service vehicles and machinery as well. This can directly affect the health of onsite workers over the short to long term, as well as any adjacent community on a shorter term. The direction of the wind and where it would transport such fumes is also an important consideration.

Dust also arises from cleared land that has been exposed to the sun, is dried, and the wind carries this material to nearby residences as well as onto adjacent farm crops. Similarly, uncovered fines such as sands or even cement can be light enough to be blown by the wind either when being transported or being stored on site. This can be a nuisance to the community and to motorists.

The mishandling of particularly noxious chemicals such as solvents or chemical washes, greases, that produce fumes or odours, as well as the burning of solid wastes on the construction site, especially used and empty chemical containers, can lead to air pollution and negative resultant health impacts especially for onsite workers. The fumes from burnt chemical containers have a high potential to be carcinogenic by reason of their content.

5.1.6 Potential Worker/Occupational Health and Safety Related Impacts

Safety must always be a priority for all workers on this project as well as that of motorists and the residents of the adjacent community. Any mishandling of equipment, improper storage and usage of various chemicals and construction materials, high levels of continuous noise and fumes from generators, excavators, haul vehicles as examples, as well as inadequate safety equipment, poor workplace practices, can contribute to adverse health effects. A predominant risk in drilling work is from reciprocating equipment which can result in injuries such as pinched fingers, lacerations, etcetera. A site kept in a disorderly manner coupled with poor housekeeping practices where equipment or material is improperly stored, spills not immediately attended to, or continued wet conditions on site can lead to occurrences such as slips, trips and falls which lead to injury. Serious injury means down time for the workers and the project as it may have to cease operation depending on the severity of the situation. Operating machinery

without the proper instruction, personal protective equipment, or safety signage is also a critical issue. The improper usage or management of chemical substances not conforming properly with storage, intended usage, or proper disposal poses a health risk.

Improper food waste management will tend to increase the potential for vector infestation and possible transference of diseases. The management of wastewater, and in particular human wastes generated by the work force on site is very critical to ensure a healthy working environment and reduce the risk of faecal contamination. Possible contamination by human waste due to lack of adequate toilet facilities is always a concern and more so within the river which leads to the coastal area.

There is also the risk associated with weather events such as rainfall which provides for wet and slippery conditions increasing the potential for falls as well as accidents with heavy equipment. Soils become saturated and loose contributing to the unsafe working environment. The adjacent river will naturally increase in volume during heavy rainfall or storm events providing for increased potential for loss of parts of the site, materials, and equipment. No work should be occurring during any adverse weather occurrences. The contractor will need to conduct a risk assessment of the site and job activities to develop their occupational health and safety management plan and the emergency response plan and minimize the risk of injury by conducting various job activities related to the project.

5.1.7 Traffic, Public and Community Safety Impacts

The existing Windward Highway is a key link between the north and south of the island, and the internal Overland Mountain access road is a key route for farmers to access their farmland in that and the hinterland area. There is the possibility of increased construction-related traffic, albeit for a temporary period, for such civil works along the highway and the internal access road, both of which require proper traffic management plans with clear procedures. The potential for vehicular/vehicular and pedestrian/vehicular conflict increases (including bicycles and cyclists) as the scale of construction increases if proper traffic management procedures are not implemented. This can lead to very tempered negative response from the nearby residents, the community, and vehicle operators affected. The matter of safety also becomes a great concern in relation to the speed of the project related vehicles as well as the alertness of the drivers as they traverse the road into and out of the site. Combined with this may be inadequate instruction of project vehicle drivers, lack of warning signs, and on ground manoeuvring directions during the period of the project construction and establishing the drilling equipment. This speaks to eh need for a Traffic Management Plan to be prepared by the contractor to address these potential traffic conflict issues.

Lack of information within the community through lack of adequate communication by the contractor and project proponents on the specific or extra working hours if required, can mean the unpreparedness of residents who tend to walk the road at certain times for the presence of construction traffic., especially in the later evenings. This become particularly hazardous if there are children within the vicinity from the community. This can also prove a major threat for motorist along the highway or through any diversion routes if there are inadequate traffic management measures that include road signage, unbarricade areas, and lack of signal staff along the roads. Such factors must be considered in the planning and execution of these wellfield works. Road users would need to be vigilant.

Even after the workday, there is always the possibility for curious persons, including children, visiting the sites unsupervised and increasing the risk for personal injury. All security measures must be put in place.

The breakdown of a construction vehicle causing the blockage of the public road at or before the site on the Highway and possibly hindering access to and from the various communities, especially during the morning rush hour, can escalate tensions. This is especially so if such an event contributes to loss of travel time to work, school, or returning home for persons. In the case of the Overland Mountain sites where the road accesses existing farmland beyond the sites, farmers who access their lands by vehicle or through walking, will be negatively impacted regarding their ability to tend their crops within the time that they have allocated to do so.

This can also occur with the spillage of large quantities of construction material. Similarly, blockage of any bypass route would similarly impact road users and the communities. Associated with the movement of vehicles, there is always the additional impacts of dust, fumes, noise, and vibrations as highlighted above.

5.2 Climate Change Impacts

Climate change as a result of global warming is a phenomenon affecting small island states (SIDS) such as Saint Vincent and the Grenadines because of the small spatial area and sensitive environments. The impacts are noticeable and can be significant over time and are reflected in:

- Warming temperatures and more extreme weather.
- Retreating of fish into deeper and cooler waters,
- Saltwater intrusion into their groundwater supplies[5]

The National Adaptation Plan for SVG under the UN Framework Convention on Climate Change projected rainfall and temperature for SVG through the end of the century highlighted the following climate change factors that will affect the Caribbean and Saint Vincent and the Grenadines derived from climate modelling:

- An increase mean temperature by 0.15 °C per decade over the next century with a similar warming trend projected for seasonal changes.
- An increase in the frequency of hot days and nights by the end of the century while cold days and nights will show significant decline, almost reaching nonexistence by the 2060s.
- A reduction in rainfall, with negative median values ranging from 10 % to 22 % annually by the 2090s drying in the wet season from June to November, with the greatest seasonal change seen in the summer months (7.1 % per decade).
- A reduction in the rainy season that will significantly affect water availability.
- More intense future north tropical Atlantic hurricanes with higher peak wind speeds and heavier near-storm precipitation.

[5] https://www.adaptation-undp.org/projects/saint-vincent-and-gernadines-second-national-communication-progress

- Increases in Caribbean Sea level rise to be near the global mean of 0.5 m to 0.6 m in the range of 2018 to 2100 when compared to 1986 to 2005.

The country's coastal areas are particularly vulnerable to the effects of sea level rise as 85% of the population and 90% of the country's infrastructure inhabit a narrow coastal strip that is less than five meters above sea level and under five kilometers from the high-water mark. The local economy and the nation's water resources remains vulnerable to the impacts of variable precipitation, extreme weather events and increased evapotranspiration.[6]

What this means is the designs under this water project must be climate sensitive and responsive to ensure that they fulfill the need to be climate resilient to ensure long term reliability and service to the communities. These climate change related factors and must apply throughout the whole life cycle of the project from design, construction, to full operation and routine maintenance procedures.

The Atlantic hurricane season within the Caribbean runs from the 1st of June to the 30th of November. The National Oceanic and Atmospheric Administration (NOAA) has predicted that the Atlantic and Caribbean region may experience "near-normal" hurricane activity this year with a predicted range of a 40% chance of a near-normal season, a 30% chance of an above-normal season and a 30% chance of a below-normal season. NOAA has a 70% confidence in these ranges and has predicted the chance of 12 to 17 total named storms with wind speeds of 39 mph or higher) and of those, 5 to 9 could become hurricanes (winds of 74 mph or higher), including 1 to 4 major hurricanes (category 3, 4 or 5) with winds of 111 mph or higher). This could be the result of a high potential for the El Nino phenomenon to develop this summer, which could suppress Atlantic hurricane activity following three hurricane seasons with La Nina present.[7]

Appreciating this, it becomes necessary that all requisite preparations and precautions must be taken to reduce potential risk when an impending tropical storm or hurricane is announced by regional and local official sources. Saint Vincent and the Grenadines has attempted to implement a number of policy measures and procedures to attend to the effects of climate change on the islands which include such initiatives the National Adaptation Plan, National Climate Change Policy, along with more sector oriented plans where climate change is highlighted as well as the National Social and economic Development Plan.[8].These plans are generally geared at acknowledging the existence and effects of Climate Chang, and focusing on reducing Saint Vincent and the Grenadines' vulnerability to its impacts by initiating and building adaptive capacity and resilience. The National Climate Change Policy prepared by the Ministry of Finance, Economic Planning, Sustainable Development and Information Technology, for example, is aligned with the National Economic and Social Development Plan (2013-2025) as well as the National Adaptation Plan (2018-2030). It provides an institutional framework for an integrated and coordinated response that would engage all stakeholders for climate change adaptation and mitigation, and seeks to enable harmonization across sectoral policies and plans. As a Climate change planning and decision making

[6] (https://www4.unfccc.int/sites/NAPC/Documents/Parties/FINAL%20NAP_SVG_Approved.pdf)
(https://www.adaptation-undp.org/projects/saint-vincent-and-gernadines-second-national-communication-progress)

[7] https://www.noaa.gov/news-release/2023-atlantic-hurricane-season-outlook#:~:text=NOAA's%20outlook%20for%20the%202023,of%2039%20mph%20or%20higher).
[8] https://www.cepal.org/sites/default/files/presentations/1_1-saint-vincent-2022-sustainable-national-policies.pdf

tool, the policy highlighted the existing climate situation and future change trends and impacts, along with a policy framework that sought to build on existing policies, institutional structures, and initiatives across sectors to ensure an integrated, cross-sectoral approach to building climate change resilience. The adaptation objective in the policy document is to reduce the vulnerability to the impacts of climate change in Saint Vincent and the Grenadines through building adaptive capacity and resilience, especially among the most vulnerable population. Twelve key areas for adaptation were identified from Agriculture to Waste Management, including water.

In regard to water resources as a key area for adaptation efforts, the objective is to "ensure a safe, reliable and sustainable supply of water to the population and efficient use of water resources to build resilience".[9] The efforts by the CWSA and the Client would be consistent with this national policy objective.

The borehole detailed design and the final implementation must be cogniscent of these climate change related factors. The inclusion of means and methods to ensure aspects of climate resilience and the concept of building back better is fundamental for such an infrastructural project.

The contractor who is engaged for the project works must ensure that an appropriate Adverse Weather Response plan is prepared and adhered to in the event of an announcement to ensure the safety of all workers and reduce the risk to life. This plan is to clearly outline the actions to be taken on each construction site prior to the arrival of a storm, during, and post, and must comply with all requisite national emergency management requirements. This would also include heavy or very intense rainfall by themselves as an event, or as pre storm events. It must be noted that that events such as intense or heavy rainfall can prove destructive, and even more destructive than storms depending on the existing or worked site and environmental conditions.

6 SOCIAL IMPACTS

6.1 Socio-Economic Profile / Baseline Socio-Economic Conditions of the Project Area

6.1.1 Overland Community- Brief Background

The following background information on the Overland community is provided for context within this social impact study.

6.1.2 Location

Overland is a coastal village bounded by Sandy Bay to the North and Orange Hill to the South. It is located within the parish of Charlotte. Charlotte is the largest parish in Saint Vincent and the Grenadines, it is situated on the eastern coast of the Island and has an area of 149 km. Charlotte has the longest coastline of all the parishes therefore it is accessible by both land and sea.

[9] https://canari.org/svgclimatepolicy/

6.1.3 History/Historical Development

The communities of Overland and Magum developed from the original estate that was established in the 19th century and owned by the Barnard family. Arrowroot, Cassava and banana were the main crops grown. After the closure of the Arrowroot factory in the mid-1960s, these lands were purchased by the government, with funding from the United Kingdom. Most of the lands were then leased to the persons that worked on the estate. The workers were given two lots of land, one to build a dwelling home on and another lot for their firstborn child. Overland is a small farming community that is separated by a river to the small community of Magum. At present, bananas, eddoes, tannia, plantains, watermelons, pepper along with arrowroot are the crops produced in the area.

6.1.4 Population

It's important to note that the community of Overland falls within the Sandy Bay Census Division. The communities of Overland and Magum are found in the Georgetown Census Division. According to the 2012 Housing and Population Census, the community of Overland had a total of four hundred and forty-eight (448) households and a population of fourteen hundred and forty (1440) people. The surrounding communities which include Magum had a total of one hundred and six (106) households, and a population of three hundred and twenty-six (326) (CDB, 2022).

6.1.5 Household Size

The average household size in the Georgetown administrative division was 3.2 persons, marginally higher than the national average of 3.0 persons per household. Household sizes ranged from 1 to 14 members. Single person households accounted for 28.6%, 2-4 member households accounted for 45.5% and households with five or more members accounted for 26%. (CDB 2022)

6.1.6 Educational Attainment

The Tourama/Overland Primary School is the only educational institution in the Overland area with the nearest secondary school, the Sandy Bay Secondary school, at Sandy Bay. A daily subsidized school bus service is accessible to students from Overland, Magum and the other surrounding areas to commute to and from these schools. In 2012, approximately 27.6% of the population of this Census Division was enrolled in full or part-time education. Institution types ranged from nursery to tertiary and adult learning institutions.

6.1.7 Health Care Institutions

There is one (1) Health Clinic that serves the entire community. This clinic is housed in a building that was formerly a church. The closest hospital is the newly built Modern Medical Diagnostic Complex, which is approximately (9Km) or about fifteen (15 minutes) from Overland.

6.1.8 Sanitation

General sanitation in the Overland and Magum communities is through water closets and a few pit latrines. Fifty-eight-point seven percent (58.7%) of households in the division have water closets linked to a septic tank or sewer, 12.3% use a ventilated improved pit latrine and 25.4% use a non-ventilated latrine. Water supply source is mainly through public piped into dwelling (66.6%) or into yard (24.1%). Some villagers make use of the river as a water source. Garbage disposal in these two communities is not a problem. The villages have a reputation for cleanliness and are holders of the best kept village competition for five consecutive years 1992-1995. Garbage is collected every Monday throughout the communities by the Solid Waste Management Department of the Central Waters and Sewerage Authority and 95.6% of households dispose of garbage through the public disposal system. (CDB, 2022)

6.2 Social Impacts

The following social impacts were determined based largely on the scoping exercise during the site visits, research, the various consultations including CES and CWSA technical leads, and consideration of the proposed design. In the event that there are any additions or revisions to this wellfield design that raise any additional social impacts, these will be considered and appropriate mitigative measures outlined.

The impacts identified below are not considered long term and are considered manageable with continued consultation with key stakeholders and affected parties.

6.2.1 Social Conflict Impacts

Social conflict between expatriate and local workers could arise due to cultural differences. To minimize this risk, it is essential that expatriates are provided with information on Vincentian culture, including dressing code, and acceptable forms of interaction with the communities. Sensitization on sexual harassment (SH) sexual exploitation and abuse (SEA) must be provided to the workforce. Sessions on sexually transmitted diseases, and other essential social factors should also be provided. The contractor will be responsible for ensuring that all his employees, including subcontractors, are sensitized on the CoC, and that they sign the code before commencing work on site. The Code of Conduct will be applied at all times.

6.2.2 Labour Management Impacts

Construction work is classified as highly labour intensive and sometimes underaged males are employed. In some instances, these children are made to work for long hours, and they are paid less than the market rate and official minimum wage for their labour. In some cases, the underaged employees are not provided with the necessary training or PPE resulting in them being injured on site. Employment of anyone under the age of 18 yeas is strictly forbidden. All employees should have an employment contract which details their roles and responsibilities, their wages per pay period and any benefits which are provided. The contract must be signed by the employee with a copy of their national ID attached.

6.2.3 Impacts on Sensitive Receptors

The main sensitive receptors in Overland are the Primary School in Overland, and the health clinic.

Extended water shortages during construction could potentially impact the operations of the establishments particularly resulting in the closure of schools and loss of instructional hours. The clinics may shorten their operating hours, possibly hindering the client's ability to access services. Any project related accidents or emergencies may also place an additional burden on the centre's resources.

Continuous, communication with the establishments prior to water interruptions, which will allow the collection and storing of water, and the trucking of water to the various establishments are measures that can be used to reduce the impact of potential water interruptions.

6.2.4 Impact on Social and Community Dynamics

An increase in traffic volumes is expected during the construction phase, particularly of construction equipment and heavy trucks. This may cause traffic congestion, since the main highway and feeder roads are quite narrow, and this may result in an increase in road accidents. The change of routes or detours may significantly increase travelling time for commuters. The increase in traffic congestion and delays can lead to increasing rates of road rage and possibly harassment of workers.

As there is no heavy reliance on pipe-borne water for irrigation, as indicated by farmers in the project areas, there are instances when farmers, specifically vegetable farmers resort to using pipe borne water for irrigation. However, there is not any risk of extended interruptions in the water supply or risk of farmers not having access to water for irrigation and loss of crops associated to the drilling works.

6.2.5 Impact on Cultural Heritage

Although the specific project drilling sites within Overland are not known areas of high cultural significance, construction of the water infrastructure may necessitate soil excavations that could be deep enough to dig up/or uncover archaeological artefacts hidden from view, especially since the project area is part of the area which was originally occupied by the Garifuna. The ESMP will provide guidance in the Chance Finds Procedure to ensure that project activities do not alter or cause destruction or degradation of any areas of cultural significance.

The ESMP will include: (i) a Chance Finds Procedures for all construction works requiring civil contractors to take proper protective measures in case cultural heritage sites are discovered, including to stop construction activities if cultural property sites are encountered during construction; and (ii) provisions for a Cultural Heritage Management Plan (CHMP) if required for civil works outlining mitigation measures to be considered avoid or reduce impacts on community cultural heritage sites directly affected by the project.

6.2.6 Impact on Site Security

The two sites identified as a priority for the works are open areas on both sides of the highway. This openness provides the opportunity for encroachment into the work area and the PV location with the opportunity for theft or vandalism to equipment. There is also the possibility of encroachment by adjacent planting activities and by animals that may be tethered on the sites to graze. In order to reduce this risk of

unwanted encroachment, both sites will have to be secured by fencing with a gate to manage access. The ESMP will require this measure as a security mitigation measure.

7 MITIGATION MEASURES

7.1` Environmental Measures

The proposed mitigation or mitigative measures address the potential impacts of the project works and attempt to reduce or avoid any negative impact on the environment over the short to long term. While these impacts are not expected to be major, the careful implementation of mitigative measures will allow for the reduction or avoidance of any adverse effects.

A number of general impacts have been identified above and the following in the table 3 below is a list of the potential mitigative measures. The measures are presented in a manner that makes them easily incorporated into the ESMP that is to be prepared, as well as within the contract clauses for the contractor who will undertake this work. This also allows for ease of monitoring by the client and key agencies.

Table 3 Environmental Impacts and Mitigative Measures

Environmental Impacts	Activities	Mitigation Measure	Monitoring Responsibility	Frequency
Removal of trees and vegetation loss	-Excavation -Preparation of site -Construction of access roads	- The contractor shall arrange the works to minimize the amount of vegetation that needs to be cleared (for the permanent and temporary works) as agreed with the Supervising Engineer, and mark this area clearly on site.	Contractor, Consultant, VEEP, CWSA	At the start of the Works During land clearing exercise
		-The contractor shall not clear vegetation from outside the marked area to ensure no unnecessary clearing of vegetation and minimal impact on flora and fauna in the area.	Contractor Consultant, VEEP, CWSA	weekly
		- The contractor shall not use herbicides, chemicals or pesticides during the works.	Contractor Consultant, VEEP, CWSA	weekly
		- The contractor will ensure the work area and activities do not enter, include, damage, or exploit any recognized natural habitats; wetlands and protected areas in the immediate vicinity of the activity must be protected from damage or exploitation.	Contractor Consultant, VEEP, CWSA	weekly
		- The contractor shall ensure that all staff are strictly prohibited from hunting, foraging, logging or engaging in other damaging activities within or outside of the demarcated work site.	Contractor, Consultant,	Daily
		- The contractor under supervision of the supervising engineer will not undertake any	Contractor, Consultant	Daily

		unlicensed borrow pits, quarries or waste dumps within or outside of the demarcated work area. - The contractor shall ensure all green wastes are immediately removed from the work area upon completion of works and properly disposed of as per local regulations or provided to nearby farmers who may wish to utilize such,	Contractor, Consultant, VEEP CWSA	Upon completion of Works
Soil Erosion and Slippage	-Excavation - Construction of access -Drilling Operation	The contractor under the supervision of the Supervising Engineers shall undertake the following measures to ensure erosion within and outside of the work area is prevented, and to prevent run-off from the from spreading beyond the marked area: • install a proper drainage system which will include energy dissipator (catchment pits) at locations guided by the supervising engineer and marked on a map to reduce the velocity of water discharged during the pump tests. • Any drain clogged by construction material or sediment will be unclogged as soon as possible to prevent overflow and flooding. . -The contractor shall, under the guidance of the Supervising engineer ensure that no undue erosion occurs on or outside of the demarcated site by reason of the works undertaken by undertaking the following: - implementing appropriate erosion control measures such as Proper site drainage which includes piping or cut drains, energy dissipators, and silt fences, or any other measures determined by the Supervising engineer. - ensuring no unnecessary removal of mature deep-rooted trees - ensuring the angle of the slope of any excavation undertaken is kept within the limits of soil type. - ensuring the angle of repose of any loose material delivered to site is kept at 45 degrees or less to ensure stability. - ensuring the covering of any loose materials as necessary to protect it against rainfall and wind. - balance cut and fill to limit the steepness of slopes. - use of bio-engineering methods where necessary as a measure to reduce erosion and land slippage. - the monitoring of all piled material, slopes, and excavated areas must for movement.	Contractor, Consultant, Contractor, Consultant, VEEP, CWSA Contractor, Consultant	Daily Weekly Daily

Increase and vibration and noise levels	-Excavation -Borehole Drilling operation	- The contractor shall develop and implement a public notification and noise management plan under the supervision of the Supervising Engineer to assist in managing the potential impacts noise and vibration impacts on the community. This plan will facilitate the receipt of complaints from residents and actions to be implemented. - The contractor under supervision of the Supervising Engineers shall undertake the following: • inform the affected community/public in advance via all available media of any work activities that are to occur outside of normal working hours or on weekends. • ensure that the work site area is hoarded to assist in sound mitigation. • ensure that the engine covers of generators, air compressors and other powered mechanical equipment shall be closed, and equipment placed as far away from residential areas as possible during the operations of the drill rigs. • ensure that no excessive idling of construction vehicles or equipment is allowed at the sites. • ensure that noise suppression equipment or systems supplied by the manufacturer are utilized on vehicles or equipment where necessary. • Ensure all vehicles and equipment are properly serviced.	Contractor, Consultant, Ministry Health VEEP, CWSA Labour Dept	Daily Daily Weekly Weekly Upon the occurrence of a complaint or event by worker
Dust Nuisance	-Excavation. -Mobilization -Delivery of equipment and materials. -Drilling operation	The contractor shall undertake to reduce and manage all potential dust nuisances by undertaking the following measures: -Provide and apply water to dampen access roads and the working area when there is high dry and dusty conditions to minimize impacts on adjacent community. -ensure that any materials which are observed to be causing fugitive dust emissions are covered or dampened down. - ensure all vehicles transporting materials such as dry dirt, cement, sand or other fines, or construction waste material and debris are fully covered until they reach their drop-off point -ensure no unnecessary speeding by transportation vehicles will be allowed on the dusty roads into the site	Contractor Consultant Labour Dept Ministry Health VEEP, CWSA	Daily Daily Upon the occurrence of a complaint or event by worker Weekly or upon the occurrence of a complaint or event Weekly
Air pollution	-Excavation -Drilling rig operations	The contractor shall undertake the implementation of the following measures to reduce any potential air pollution during the works: - Ensure that all dry dirt or construction materials such as sand, cement, or other fines are kept properly covered. - Cement must be stored within a shed or container.	Contractor, Consultant Supervising engineer Ministry Health	Daily Daily Daily Weekly or upon the occurrence of a complaint or event

		- The sand and fines must be kept moistened with sprays of water while uncovered. - Compacted and then wet periodically wet unpaved, dusty construction accessways - undertake water spraying and/or installing dust screen enclosures at the site to suppress dust during drilling - no open burning of dry vegetation or waste material will be allowed at the site. - no excessive idling of construction vehicles and equipment will be allowed at sites.	Labour Dept VEEP, CWSA	Upon the occurrence of a complaint or event by worker Weekly
Contamination of soil & Water	-Excavation -Mobilization and Drilling operation -Construction	The contractor shall ensure the following measures to reduce the potential for soil and land contamination during the works: -that the appropriate seals (clay and concrete) are placed between the walls of the casing and borehole and capped so that no waste matter (human, animal, or otherwise) especially during runoff that may enter is prevented from doing so and contaminating well water. - that drilling fluid and muds (presumably bentonite) will be contained in pits or tanks, and disposed of properly, and not allowed to pollute land or waterbodies. - Runoff and construction liquid waste especially with chemicals should be minimized as much as is reasonably possible. - Runoff water must be channeled to a settling pond or chamber with restrictions to access by unauthorized personnel and untethered animals. -This pond or chamber area shall be cleaned at the end of construction or when filled and the waste transported to an authorized solid waste facility. - The washing of equipment shall be done in a designated area that will allow waste produced to be captured in a settling pond. - Machinery and construction equipment are to be maintained in good working condition, to prevent oil leaks. - An area shall be clearly defined within the working site with the supervising engineer where all refueling and replacing of hydraulic or brakes fluid or other lubricants in equipment and plant must be undertaken to prevent oil and grease from polluting the environment. Moreover, an area shall be clearly defined and prepared to ensure that is fit for the purpose intended and all spill management measures are installed or available. -Oil absorbent sheets as well as buckets of sand shall be kept within the area to be placed on any spills as part of containment and clean up procedures. - all fuel tanks shall be kept in a sumped area constructed of concrete as designed and instructed by the supervising engineer. - All liquid materials must be kept covered at all times, and drip trays are to be used when tanks are filled.	Contractor, Consultant VEEP, CWSA Supervising Engineer Ministry of the Health Fisheries Dept	Daily weekly Routine inspection or upon any occurrence of soil pollution Upon any occurrence in the coastal area from runoff

		- all users are familiar with the SDS sheet information for various chemicals that may be used to ensure safe handling - In the event of spillage, the Contractor must immediately notify the monitoring officer and in their presence, unless otherwise indicated, remove all contaminated material from the site, store it in the appropriate container and disposed of at the authorized waste disposal facility (Proof of disposal must be provided to the Supervising Engineer, and kept on the ESMP Environmental Monitoring File).		
Solid and liquid waste (General)	-Excavation -Construction -Drilling Operation	The contractor shall develop and implement a waste management plan in consultation with the national solid waste management authority. The plan must include practices and procedures that shall ensure the contractor abides by all relevant waste management and public health laws. The contractor shall identify waste collection and disposal pathways and sites for all major waste types expected from the construction and borehole activities. - All construction and demolition waste will be stored appropriately in designated areas on site agreed with the Supervising engineer, including plans for disposal and frequency. - All Liquid and chemical waste shall be stored in appropriate labeled and sealable containers and separated from the general refuse. - All waste will be collected, placed in appropriate waste bins or sealable plastic bags and disposed of regularly at the approved landfills by licensed collectors. - The contractor shall ensure that records of waste disposal will be maintained and made readily available for inspection. - the contractor shall reuse and recycle appropriate and viable materials (except asbestos or other hazardous material whenever feasible). - The contractor shall ensure no construction or drilling related liquid wastes is allowed to accumulate on or off the site, flow over or from the site in an uncontrolled manner or cause a nuisance or health risk due to its contents. - The contractor will actively undertake efforts to minimize any construction waste and reuse where possible by following the agreed plans or in consultation with the supervising engineer.	Contractor Consultant VEEP Solid Waste Management Agency Ministry of the Health VEEP, CWSA	At the start of the Works Routine collection daily or on the occurrence of an event Weekly or upon the occurrence of a complaint or event Weekly
Solid and Liquid waste (Hazardous)	-Excavation -Construction -Drilling Operation	The contractor shall develop and implement a waste management plan in consultation with the national solid waste management authority. The contractor shall undertake measures in agreement with the Supervising Engineer to reduce and manage any potential impacts for the use or storage of hazardous solid and liquid waste by undertaking the following measures: -provide a designated area on site for the temporary storage on site for all hazardous or toxic substances in safe leak proof containers	Contractor & Staff Supervising Engineer Solid Waste Management Agency Ministry of the Health	Daily Daily Routine collection daily or on the occurrence of an event

		labelled with details of composition, properties and handling information to prevent unauthorized access, spillage and leaching. Moreover, an area shall be clearly defined and prepared to ensure that is fit for the purpose intended and all spill management measures are installed or available - ensure that all wastes shall be transported by specially licensed carriers and disposed of at a licensed waste facility. - do not use any lead-based paints or paints with toxic ingredients or solvents. - do not use any banned chemicals. - If termite treatment/pest control is to be utilized, appropriate chemical management measures will be implemented to prevent contamination of surrounding areas and use only licensed and registered pest control professionals with training and knowledge of proper application methods and techniques.		Routine inspection monthly or on the occurrence of an event
Natural Disaster (Meteorological Event) Adverse Weather	Excavation Construction Drilling Operation	The Contractor shall prepare a Disaster Preparedness Management Plan which would also include measures to be implemented during adverse weather. This plan will include all emergency contacts, procedures to be implemented, responsibilities, and follow up activities following the event to ensure the safety of all workers and equipment.	Contractor, Consultant CWSA Supervising Engineer VEEP	Upon pre, during, and after event Pre and post event Pre and post event Post Event

7.2 Social Impact Measures

The Social Impact mitigative measures outlined below are aimed at preventing the identified adverse project impacts to society and to maintain and promote social cohesion throughout the project cycle. It highlights all aspects of planning, design and project operation relevant to society in addition to identifying project specific activities likely to trigger adverse social impacts. Appropriate mitigation measures ae proposed to prevent or minimize the potential negative social impacts that might occur. Table 4 below outlines the impacts, and the measures. After the change of the area for the borehole drilling activities and associated works, which was forced by the constrains appeared for using the land initial selected, in the present version of the report [the fourth version of the Environmental and Social Impact Assessment for Boreholes Drilling at Overland] there is not considered any encroachment onto private property.

Table 4 Social Impacts and Mitigative Measures

Social Impacts	Activity	Mitigative Measure	Monitoring Responsibility	Frequency
Occupational Health and Safety Issues	Excavation Construction of access Drilling Operation	The contractor shall ensure that an Occupational Health and Safety Plan is prepared and implemented to guide work activities and provide a safe environment for workers. This plan shall include but not be limited to the following: - the risk assessment to inform the development of the required method statements; -details of the equipment, materials and approaches the contractor will adopt to comply with the contract requirements and deliver the works in accordance with the *Construction Phase Health and Safety Plan* described in the ESMP; - the minimum PPE that is required to undertake the required works, and what additional PPE will be provided as a last resort to reduce the severity of any potential injuries; -the medical and first aid equipment on site and the personnel who will be present and provide aid during works; an emergency response plan; -the training to be provided to workers, including a general induction in accordance with the World Bank's General Induction for Construction Workers.[10] - The Contractor will select a suitably qualified employee to serve as the H&S Officer. - The contractor's H&S Officer and Supervising Engineers /Consultant will ensure that all relevant Labour and Occupational Health and Safety regulations are adhered to, to ensure worker safety and any infringement is recorded, reported to the Supervising Engineers / Consultant, and relevant authorities. -The contractor shall provide the necessary equipment as well as protective gear as per their specific tasks such as hard hats, overalls, gloves, goggles and boots to all workers and the H&S Officer will ensure that employees utilize the PPE. -The contractor shall provide Sanitary facilities for all workers on site. -The contractor shall ensure that basic medical supplies are available on-site which includes a first aid kit and staff trained in basic first aid. -The contractor must conduct an OHS briefing to all employees prior to the commencement of work, and to any employees joining the work staff after the official commencement of works. - H&S briefings / training including appropriate use of PPE, with all employees must be documented and the employees must sign off to acknowledge receiving the training. - The Contractor must hold periodic refresher training sessions. - Appropriate posting of information within the site must be done to inform workers of key rules and regulations to follow. The measures should be reinforced at toolbox meetings. The Contractor must adhere to the Labour Management Procedures (LMP) The contractor must sign and follow the Health and Safety Guidelines presented in the ESMP.	Contractor, Consultant, Labour Department VEEP's PIU Contractor, Consultant, VEEP	At the start of the works Weekly Prior to commencement

[10] (Training for Construction Workers - General Induction: Safety, Health, and the Environment | Korea Green Growth Trust Fund (wbgkggtf.org)).

Increased road safety hazards and inconvenience to road users and the general public caused by the construction traffic/works interfering with normal traffic flow.	Mobilization -Delivery of equipment and materials.	- Contractor shall at all times take care to protect the public and facilitate the uninterrupted flow of traffic during his operation and use of public roads, thus the Contractor must ensure that: -Workers shall obey all traffic laws in order to minimize the risks to pedestrians - The contractor shall develop and implement a traffic management plan -Contractor shall erect appropriate (approved) signage along the access road to alert other road users to possibility of slow construction traffic/heavy equipment crossing lanes etc. -Construction vehicles must be licensed in accordance with local laws and regulation. - The Contractor will utilize signalers to direct traffic when required. - The Contractor will inform the police in advance of activities that are likely to interrupt traffic flow and seek assistance with traffic management. -The Contractor shall consult the relevant agencies /departments early for approval and advice if there is likely to be any traffic disruption.	Consultant, VEEP's PIU, BRAGSA	Prior to signing the contract and throughout construction
Hazards associated with roadside storage of construction materials and parking of plant and vehicles.	Material and Equipment Storage	- The Contractor shall not park or stockpile materials along the public roadway. - No materials shall be stored so that they encroach on, or in any way adversely affect operation of, sections of roadway which are in use by the public or result in siltation or blockage of drains. - Contractor must plan for the temporary storage of construction materials and wastes, and the parking of construction plant within the worksite only. This will be part of the Site Management Plan. - Contractor shall erect appropriate signage in the vicinity of the site to warn other road users of construction traffic. - The Contractor shall ensure that parking areas for employees' private vehicles are located within the worksite only, in approved areas.	Supervising Consultant Team, BRAGSA Supervising Consultant Team Supervising Consultant Team, BRAGSA	Throughout construction Throughout construction At the start of works and throughout construction
Interference with traffic due to disposal of construction wastes, and other waste and blockage of access to and from lands adjacent to the worksite	Excavation, Drilling Excavation Drilling General construction activities Storage of construction materials	- Contractor shall abide by all solid waste regulations in the disposal of demolition waste. - The Contractor must ensure that public roads are kept free and clear of wastes. - The Contractor shall ensure that all operations are carried out so as not to interfere unnecessarily or improperly with the convenience of the public, or access to and use and occupation of public roads, footpaths, and properties. - The Contractor shall inform neighboring users in advance of any activity that has the potential to impede access to their properties or other public spaces. If needed, the Contractor will create alternative access routes.	Supervising Consultant Team, Solid Waste Management Authority Supervising Consultant Team	Throughout construction
Chance finds, protected sites, and Cultural Heritage.	Drilling Excavation	- Contractor shall not damage archaeological sites, protected areas and cultural heritage. If items of cultural or historical significance are unearthed or discovered, works must stop immediately, and the Supervision team must be informed. The Contractor will also notify the National Trust Department and other relevant agencies upon encountering any artefacts, remains or other notable objects immediately. - The Contractor shall follow the Chance Find Procedures and ensure that training is provided to all project workers on the Chance Find Procedures.	Supervising Consultant Team, National Trust Department Supervising Consultant Team, PIU	Throughout Construction

		- If human remains are unearthed, work must stop immediately, the area must be protected and the Contractor must notify first to the Police and then to the Supervising Consultant/PIU. - The site will remain closed until an investigation is conducted and the all clear is given to resume work.		
Use of Child Labour	General construction	-The Contractor shall follow the Labour Code and all other relevant legislation including the: - Protection of Employment Act, 2003 -Equal Pay Act, 1994 - Employment of Women, Young Persons and Children Act, 1935 and Amendments - The contractor shall ensure that all suppliers and subcontractors are complying with labour laws and regulations and that no persons under the age of 18 are being exploited in their operation. The Contractor must ensure that no person under the age of 18 is employed or volunteers on site. - Additionally, the Contractor must ensure that no person under the age of 18 is allowed on site without written permission from the PIU. - the contractor shall practice ethical and responsible business practices and adhere to the LMP.	PIU, Supervising Consultant Team, Labour Department	Weekly; Through construction
Development of social friction between the contractor's workforce and the public.		- The Contractor will utilize the established project grievance redress mechanism (GRM) which can be found in the Stakeholder Engagement Plan and the Labour Management Procedures, and shall assign responsibility for dealing with complaints from the general public to the site foreman, whose name and contact details must be shown on the project signboard. - Reports will be accepted during consultations with stakeholders and the wider public. The Contractor must take appropriate measures to ensure that the site is well-secured in order to protect assets on site. - The Contractor shall maintain the project's code of conduct (CoC) for all personnel, including sub-contractors for site activities. The Code of Conduct will form part of the workers' and sub-contractor contracts and all personnel must sign the CoC. - The Contractor must ensure that worker training shall include sensitization on the CoC and interactions with the general public. - All grievances will be routed to the PIU for management.	PIU, Supervising Consultant	Preceding and Throughout construction
Incidents of sexual harassment (SH) sexual exploitation and abuse (SEA)		-Contractor shall maintain and enforce the code of conduct (CoC) for all personnel, including sub-contractors for site activities. The Code of Conduct will form part of the workers' and sub-contractor contracts. - The Contractor must ensure that worker training shall include sensitization on SH and SEA.	PIU, Supervising Consultant Team PIU, Supervising Consultant Team	Throughout construction Before the start of work and anytime the contractor hires new employees.
Cumulative Social Impacts resulting from the implementation of other VEEP project activities in the project area	General construction activities	- The Contractor shall consult and liaise with the Supervising Consultant and Contractor for the other activities to where possible to synchronize their work schedules with the aim of reducing the cumulative impacts of the projects on the public.	PIU, Supervising Consultant	When required

7.3 Additional Measures

In addition to the mitigative measures stipulated above, the following are provided to guide the contractor during the two weeks of the works for the boreholes and establishment of the wells.

7.3.1 Cultural Heritage- Procedures for Chance Finds

All archaeological evidence should be documented in accordance with national law and Best International Industry Practice (BIIP). Where excavation is carried out, this should be conducted by cultural heritage experts, in accordance with national law and BIIP, with the results provided to the appropriate cultural heritage authorities. A chance find is any unanticipated discovery or recognition of cultural heritage. Most often, chance finds occur during the construction phase of a project. Such finds include, for example, the discovery of a single artefact, an artefact indicating the presence of a buried archaeological site, human remains, fossilized plant or animal remains or animal tracks, or a natural object or soil feature that appears to indicate the presence of archaeological material. When artefacts or sites of cultural heritage are encountered by chance while undertaking excavation during construction activities, the project must include a chance finds procedure, in all contracts related to construction awarded under the project.

The steps in case of chance finds to be followed are: - Stop all work and cordon off the area and do not allow anybody access to the area, unless cleared by the National Trust. - Based on discussions with the competent authorities identify further action - Actions at the site may require competent professionals who may need to be contacted and brought in, as needed. All project workers must receive sensitization training on the Chance Find Procedures

7.3.2 Stakeholder Identification

Project stakeholders are parties that have a direct and indirect interest in the project and have a direct and indirect impact on the success of the project. Due to their diverse needs and interests, stakeholders have different expectations for the project. The stakeholders of this project can be divided into seven (7) major groups; governmental, residents, community organizations and businesses, the funding agency, the Water Authority, PAPs and other interested parties.

An analysis of the project stakeholder groups identified the main benefits to key stakeholders of the project. For instance, the Water Authority will benefit from the enhanced infrastructure, which will enable the provision of improved service to the residents when the project is completed and operational. Residents and businesses in the project area will benefit from an improved water supply; additionally, employment opportunities will be created during construction.

Stakeholder engagement is critical at all stages of Bank funded projects and is an inclusive process to be

conducted throughout the project life cycle. In the World Bank's Environmental and Social Framework (ESF), "Stakeholder Engagement and Information Disclosure", is the tenth standard (ESS10) which recognizes "the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice". The ESF ensures that World Bank financed projects are guided by transparency, non-discrimination, social inclusion, public participation, and accountability. ESS 10 emphasizes that effective stakeholder engagement can significantly improve

projects' environmental and social sustainability, enhance project acceptance, and contribute significantly to successful project design and implementation. Accordingly, when properly designed and implemented, stakeholder engagement supports the development of strong, constructive, and responsive relationships that are important for the successful management of a project's environmental and social risks.

General information to be provided to the stakeholders include: (a) The purpose, nature, and scale of the project; (b) The duration of proposed project activities; (c) Potential risks and impacts of the project on local communities, and the proposals for mitigating these, highlighting potential risks and impacts that might disproportionately affect vulnerable and disadvantaged groups, and describing the differentiated measures taken to avoid and minimize these; (d) The proposed stakeholder engagement process highlighting the ways in which stakeholders can participate; (e) The time and venue of any proposed public consultation meetings, and the process by which meetings will be notified, summarized, and reported; and (f) The process and means by which grievances can be raised and will be addressed.

Community engagement is essential for the successful implementation of the project. Thus, a public town hall meeting is suggested as an effective means of communicating directly with the community and obtaining immediate feedback prior to the start of physical implementation. However, using other modalities of communication including social media posts, radio and television announcements, and notices read at church and other gatherings, may help to ensure that the information being disseminated reaches a wider audience. Virtual meetings with members of the community or key stakeholders can also be held. These engagements will be conducted by the PIU and the Design Consultant.

Stakeholder consultations for the VEEP commenced in 2021 and are ongoing. Specific to the drilling of the Boreholes at Overland, the Design Consultant has regularly engaged the Central Water and Sewerage Authority regarding development of the design. Discussions held with a church and community leader in the Overland Community on Saturday 29 July revealed that although the community is aware of the larger VEEP, there was little knowledge of the drilling works at Overland. Nevertheless, the stakeholder strongly supported and endorsed the plan to seek an alternative water source, as the community is severely affected by the interruptions in the water supply, due to heavy rainfall. The discussions highlighted announcements during church services are an effective medium for the communication of project related information, as congregants, numbering approximately 50, will subsequently share the information with residents who do not attend the church services. The availability of a church WhatsApp group was also proposed as a medium for disseminating project related information. Additionally, the Church building was offered as a venue for project meetings.

In addition to the stakeholder consultations which have been held, consultation will continue throughout project implementation. Importantly, due to the high rate of project activity ongoing on the island in the aftermath of the eruption, a number of governmental stakeholders highlighted the issue of meeting or consultation fatigue possibly impacting planned consultations. While this situation may result in less-than-optimal participation in planned community consultations, a collaborative effort with the other VEEP infrastructural project components in the scheduling and hosting of community consultations prior to the start of construction and during construction is recommended, to reduce the total number of consultations held without comprising the effectiveness of the engagements.

7.3.3 Grievance Redress Mechanism

ESS 10 [Stakeholder Engagement and Information disclosure] In keeping with ESS10 the Grievance Redress Mechanism (GRM) for the public / PAPs and workers are already available in the Stakeholder Engagement Plan, and the Labour Management Procedures (LPM) respectively.

The GRM is an effective tool for early identification, assessment, and resolution of complaints. The Government of Saint Vincent and the Grenadines recognizes a GRM as an integral tool in the development process. In the country's National Economic and Social Development Plan (2013-2025), Goal three (3) promotes good governance and increases the effectiveness of public administration: outcome, 3.3 solicits avenues to educate the public about their legal rights and avenues for redress.

The GRM also provides a special avenue for addressing Sexual Exploitation and Abuse and Sexual Harassment (SEA/SH). The specific nature of sexual exploitation and abuse and of sexual harassment (SEA/SH) requires tailored measures for the reporting, and safe and ethical handling of such allegations. A survivor-centered approach aims to ensure that anyone who has been the target of SEA/SH is treated with dignity, and that the person's rights, privacy, needs, and wishes are respected and prioritized in any and all interactions.

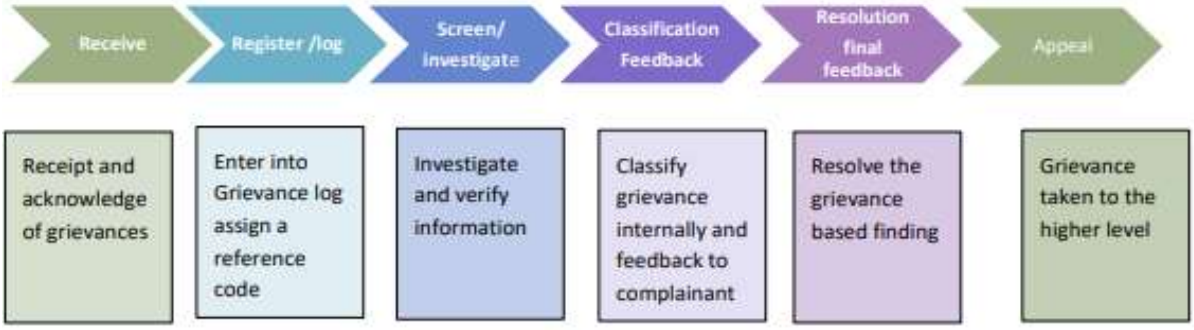
The project's Social Specialist will be responsible for dealing with any SEA/SH issues, should they arise. A list of SEA/SH service providers will be kept available by the project. The GM should assist SEA/SH survivors by referring them to Services Provider(s) for support immediately after receiving a complaint directly from a survivor.

The figure below illustrates the grievance redress process.

PROCESSING OF GRIEVANCE

The structure of the GRM is as follows:

Figure 1: Diagram of Processing Grievance



1. Receive Grievance

The PC should receive all grievances. Through the consultation process in each participating country, stakeholders will be informed of various avenues through which the mechanism can be accessed.

Mode of receiving grievances

Complaints can be made in person, anonymously, writing, verbally over the phone, by fax, emails or any other media.

Sample Notification to the public on mediums through which grievances can be submitted

Email:	cenplan@svgcpd.com
Telephone:	784-457-1746
By letter:	The Project Grievance Officer -
	Volcanic Eruption Emergency Project
	Ministry of Finance, Economic Planning and Information Technology
	Bay Street
	Kingstown

The complete GRM can be accessed on the VEEP website at https://veep.gov.vc/veep/. The Reporting forms and the list of GBV Service Providers are appended within the project ESMP.

7.3.4 Labour Management Procedures

This Labor Management Procedures (LMP) is developed by the PSIPMU as a requirement of the World Bank Environmental and Social Framework in support of the VEEP. The LMP seeks to ensure that measures are in place to manage and mitigate risks associated with employment under the project. The LMP identifies the main labor risks and requirements under the project and establishes the parameters to ensure that these are undertaken and managed in accordance with the requirements of the Environmental and Social Standard2 (ESS2) – Labor and Working Conditions and Occupational Health and Safety. The labor management procedures contain measures to address risks that may arise from the interaction between project workers and local communities. Also included are measures to raise awareness of such risks; communicate expectations regarding appropriate conduct, together with disciplinary measures; and the adoption of the code of conduct.

The objectives of ESS2 and the LMP are to:

(i) Promote safety and health at work

(ii) Establish fair treatment, non-discrimination and equal opportunity for project workers

(iii) Protect project workers, including vulnerable workers such as women, persons with disabilities, children not of working age, in accordance with ESS2 and in-migrant workers, contracted workers, community workers and primary supply workers, as appropriate

(iv) Prevent the use of all forms of forced Labor and child labor; support the principles of freedom of association and collective bargaining of project workers in a manner consistent with national law

(v) Provide project workers with accessible means to raise workplace concerns.

As per initial assessments and the outlook for various subprojects for infrastructure reconstruction and development, it is understood that risks as it relates to Labor and working conditions and occupational health and safety are expected to be minimal. When risks are identified, those will be addressed and managed by the procedures set out in the LMP. The GoSVG is strongly committed to evaluating risks and impacts throughout the life of the project and managing the adverse impacts. The LMP is applicable to all project workers.

The LMP applies to all project workers, whether full-time, part- time or temporary.

The complete LMP can be accessed on the VEEP website at https://veep.gov.vc/veep/.

7.4 Monitoring

Environmental and social monitoring will be an implementation requirement to determine and ensure the borehole works are meeting stipulated conditions or requirements and are not negatively impacting the environment or people. The monitoring program will assist in determining the effectiveness of the

environmental and social management mitigation measures and provide early warnings of any distress, pollution, and other incidents so that the required corrective action can be implemented. The monitoring programme will also assist in determining if additional impact control measures may be required based on the environmental and social condition being experienced.

There are two basic forms of environmental and social monitoring:

1. Compliance monitoring- which checks whether prescribed actions have been carried out, usually by means of inspection and/or enquiries; and

2. Effects monitoring- which records the consequences of activities on one or more environmental or social components, and usually involves physical measurement of selected parameters or the execution of surveys, to establish the nature and extent of induced changes.

Compliance monitoring will apply to this Overland exercise, as the majority of impact controls here will take the form of environmental and social protection measures incorporated in the design and contract documents, and the extent to which these are complied with by the contractor(s) plays a major part in determining the overall environmental and social performance of the project. Compliance monitoring on this borehole exercise will afford the opportunity for a rapid response to impacts.

Day-to-day environmental monitoring will be undertaken by a suitably qualified employee attached to the design supervision firm, specifically assigned as the Site Clerk. The Site Clerk, which eventually will be the Leader of the Supervising Consultant Team, will undertake the role of Environmental Compliance Monitoring Officer and undertake systematic observation of all site activities. This person may have other responsibilities, as long as s/he is able to properly meet the environmental and social monitoring requirements.

An employee of the contractor will also be responsible for Environmental and Social Compliance Monitoring.

Reporting to the Consultant's Chief Resident Engineer, the Consultant ES Specialists will supervise the Contractor's implementation of the ESHS contractual requirements through site inspections, audits and other means as necessary; review and approval of contractor's ESHS documentation required under the contract; advising CRE on appropriate actions, including contractual remedies in the event of non-compliance; investigating incidents and identifying system changes to prevent recurrence; reporting on ESHS matters as required Monitoring will, for the most part, take the form of visual observations, and site inspections will place an emphasis on early identification of any environmental problems and the initiation of suitable remedial action through communications to contractors. Where remedial actions have been required, further checks will be required to ensure that these are being implemented to the agreed schedule and in the required form. As information of the principal problem areas come to the fore, attention will be concentrated on activities which are known to be the most troublesome.

The Environmental Compliance Monitoring Officer or Site Clerk will report to his/her Project Manager/Engineer daily, using conventional report forms whose coverage will be extended to include key environmental and social matters, while the Safeguards Quarterly Report which is appended to the Overland Borehole Drilling ESMP will provide a summary of the broader environmental and social issues

encountered during construction. The Project Engineer will decide on the appropriate course of action to be taken in cases where unsatisfactory reports are received from the Environmental Compliance Monitoring Officer / Site Clerk regarding environmental or social matters. In the case of relatively minor matters, verbal interaction with the Contractor on the need for remedial action may suffice. In all serious cases the Project Engineer/Manager has the responsibility to order a stop to any aspect of the works in the event where serious environmental damage or public nuisance/safety hazard is either imminent or has already been caused. In cases of incidents and accidents, the PIU will inform the World Bank with 24 hours and follow up action including root cause analysis shall be carried out as agreed with the Bank.

As part of the compliance monitoring there must be visitation by the CES engineers' environmental and social specialists in conjunction with the monitoring effort by the VEEP and Ministry Project Implementation Unit Team. These visits by the CES's environmental and social specialists are to ensure that the design conditions stipulated within the ESIA and ESMP are being met to ensure minimization of any negative environmental and social impacts of the various component works over the 2-week period of the activity of boreholes drilling and testing.

7.5 Reporting

Weekly reports prepared by the design supervision firm will summarize the results of the daily site monitoring, remedial actions which have been initiated, and whether or not the resultant action is having the desired result over the two weeks of the project. The reports will also identify any unforeseen environmental problems and will recommend suitable additional actions. Informal discussions will be held with the residents of the community to ascertain whether and how they are impacted by the ongoing works.

Progress meetings should be convened with the PIU, the design supervision firm and Contractor in attendance. The Environmental Compliance Monitoring Officer /Site Clerk should also be in attendance. The progress meetings shall include an agenda item which specifically covers environmental and social matters. Since environmental and social matters will probably, under normal circumstances, form a relatively small part of the overall business to be discussed at such meetings, it is also recommended that environmental and social matters should be the first item on the meeting agenda.

Environmental and Social issues will be specifically addressed and reported against in progress meetings and reports. The report will include a section on environmental and social monitoring, which should be circulated by the PIU to key line agencies.

8 CONCLUSION AND RECOMENDATIONS

The proposed Overland borehole exercise project component is expected to have a duration of two weeks and is to occur within the lower Overland area.

The following conclusion and recommendations apply to the proposed borehole exercise based on this Environmental and Social Impact Assessment study.

The potential negative environmental and social impacts of this borehole drilling exercise are not expected to be long-term or large-scale, and in general, they relate to the disruption of vegetation, disruption of the soil and landscape, air pollution, noise from construction equipment and machinery, soil pollution and disturbance, pollution of surface and groundwater, waste management, human safety, and land / crop related matters.

It has been determined that the proposed works can be undertaken with the following conditions:

1. All requisite environmental and social mitigative measures as per the ESIA are implemented.
2. The contractor must implement and abide by the stipulations of the ESIA and the ESMP.
3. The Supervising consultant CES must engage an environmental and a social inspector to monitor and ensure that the required environmental and social mitigative measures are being implemented as per the ESMP.
4. The VEEP PIU, CWSA, and all pertinent agencies must monitor the work to also ensure compliance.
5. All designs and implementation must be based on acceptable international standards for engineering, construction, environmental safety, and best management practices.

ANNEX 1 REFERENCES

CDB (2022). **Preparation of Revised Livelihood Baseline Assessment Report: Colonaire, St. Vincent and the Grenadines**. Community Disaster Risk Reduction Fund. Caribbean Development Bank. St. Michael, Barbados.

CDB (2022). **Preparation of Revised Livelihood Baseline Assessment Report: Overland and Magum, St. Vincent and the Grenadines**. Community Disaster Risk Reduction Fund. Caribbean Development Bank. St. Michael, Barbados.

CES Report_ VEEP_Saint Vincent and The Grenadines Groundwater Sources at Higher Elevations to Be Connected to Sandy Bay and Owia Systems_ **Inception Report**. May 2023

CES Report No1_ VEEP_Saint Vincent and The Grenadines Groundwater Sources at Higher Elevations to Be Connected to Sandy Bay and Owia Systems_ **Investigative reports and assessments of existing situation review. Draft designs for borehole(s) at Overland**. May 2023

CES Report No2_ VEEP_Saint Vincent and The Grenadines Groundwater Sources at Higher Elevations to Be Connected to Sandy Bay and Owia Systems_ **Final Design of Boreholes and Well Field at Overland**. June 2023

Clean Water and Sanitation: Why It Is Important: http://www.un.org/ sustainabledevelopment

Government of Saint Vincent and the Grenadines (GoSVG), (2019). **National Climate Change Policy of Saint Vincent and the Grenadines**. Ministry of Finance, Economic Planning, Sustainable Development and Information Technology. Kinston.

FAO. 2015. **AQUASTAT Country Profile – Saint Vincent and the Grenadines**. Food and Agriculture Organization of the United Nations (FAO). Rome, Italy

Kairi Consulting. St. Vincent and the Grenadines. **Country Poverty Assessment (CPA) 2007/2008**. Living Conditions in a Caribbean Small Island Developing State (SIDS). Final Report. Kingstown.

Smithsonian National Museum of Natural History. **LaSoufriere Volcanic Eruption** _Global Volcanism Program, Department Of Mineral Sciences, USA. https://volcano.si.edu/volcano.cfm?vn=360150

Saint Vincent and the Grenadines **Country Poverty Assessment 2007/2008**: Living Conditions in a Caribbean Small Island Developing State. http://stats.gov.vc/stats/wp-content/uploads/2019/03/Country-Poverty-Assessment-Report-Volume-1-2007-to-2008.pdf

Statistical Office. Central Planning Division. Ministry of Finance, Planning and Economic Development. 2012. **Population and Housing Census Report: 2012**. Kingstown, St. Vincent and the Grenadine. http://stats.gov.vc/stats/ wp-content/uploads/2018/11/Population-and-Housing-Census-Report-2012.pdf

Statistical Office. 2015. **National Health and Nutrition Survey. Non-Communicable Disease Risk Factor Surveillance Report for St. Vincent and the Grenadines**. Economic Planning and Sustainable Development Division Ministry of Finance, Economic Planning, Sustainable Development & Information Technology, Kingstown. http://stats.gov.vc/ stats/wp-content/uploads/2018/10/2015-National-Health-and-Nutrition-Survey.pdf

Statistical Office. 2022 **Saint Vincent and the Grenadines, Educational Statistical Digest 2020-2021**, https://stats.gov.vc/wp-content/uploads/2022/09/Education-Statistical-Digest-2021-1.pdf

UNCTAD (2017) ***Climate change impacts on coastal transport infrastructure in the Caribbean: enhancing the adaptive capacity of Small Island Developing States (SIDS), SAINT LUCIA: A case study***. UNDA project 1415O. United Nations Conference on Trade and Development https://sidsport-climateadapt.unctad.org/wp-content/uploads/2018/07/Case-study_Saint-Lucia.pdf

World Bank. **Environmental, Health, and Safety Guidelines** - https://www.ifc.org/en/insights-reports/2000/general-environmental-health-and-safety-guidelines)'

World Bank. **Environmental and Social Framework**- ESFFramework (2).pdf
- https://www.worldbank.org/en/projects-operations/environmental-and-social-framework
https://thedocs.worldbank.org/en/doc/837721522762050108-0290022018/original/ESFFramework.pdf

World Bank. **Environmental and Social Standards**- https://www.worldbank.org/en/projects-operations/environmental-and-social-framework/brief/environmental-and-social-standards

UNICEF ***Annual Report 2021*** United Nations Children's Fund, New York. USA

ANNEX 2 LIST OF CONSULTATIONS

Stakeholder agency	Contact Person	Date
Central Water and Sewerage Authority (CWSA)	Eng. DaSilva Eng.Jonathan Francis.	Friday 7th July 2023. Initial Meeting and then Throughout process with Eng Francis
Volcanic Eruption Emergency Project (VEEP)	Team members Ms. Sharika Mandeville Ms DeAnna Ralph Ms Nyasha Hamilton Ms,Josel John	7th July 2023 Initial meeting and then throughout process with Ms.John
Forestry Department Ministry of Agriculture, Rural Transformation, Forestry and Fisheries	Mr.Leon Matthews Ranger Supervisor	12 July 2023 and through out period
Land and Surveys Department Ministry of Transport, Works, Lands and Surveys, and Physical Planning	Mr. Keith Francis Chief Surveyor	14 July 2023
CWSA - Solid Waste Management Unit	Ms. Zinzie Robertson Solid Waste Environmental Engineer	14 July 2023
Ministry of Agriculture, Forestry, Fisheries, Rural Transformation, Industry and Labor	Mr. R. Gumbs Chief Agricultural Officer	14 July 2023
Youth Division –Ministry of National Mobilization, Social Development, Family, Gender Affairs, Youth, Housing and Informal Human Settlement	Ms. G. Anthony Youth Officer	14 July 2023
Social /Community Development Division– Ministry of National Mobilization, Social Development, Family, Gender Affairs, Youth, Housing and Informal Human Settlement	Mr. K. Collis Head- Social Department Mr. S. Yearwood Community Development Officer	14 July 2023
Chief Engineer's Office Ministry of Transport, Works, Lands and Surveys, and Physical Planning	Mr. Allistair Campbell (Chief Eng. Acting)	17 July 2023
Fisheries Department Ministry of Agriculture, Forestry, Fisheries, Rural Transformation, Industry and Labor	Mr. Kris Issacs Deputy Chief Fisheries Officer	17 July 2023
Physical Planning Department Ministry of Transport, Works, Lands and Surveys, and Physical Planning	Mr. Imron Williams Mr. Colin Layne Chief Building Inspectors	17 July 2023
National Emergency Management Organization (NEMO)	Mr.Carl Phillips Senior Planner	18 July 2023
Ecoengineering, Kairi, Trintoplan	Indranny Sammy_EcoEngineering Debbie Reyes_EcoEngineering Dr.Tameka Deare_Kairi(Social Specialists)	18 July 2023

	Andrea Able_Trintoplan	
Kairi	Dr. Tameka Deare_Kairi(Social Specialists)	25 July 2023

ANNEX 3 SITE PHOTOS

Site photos of the potential borehole drilling sites taken on Thursday 6th July 2023. C across road from existing, D existing at Overland.

Borehole BHC at Overland Magum. This area is built up with sand reclaimed from the adjacent river to the north of it. No outstanding vegetation except areas of scrub and vines. Windward Highway is to the east of it in the picture and consideration is to be given to appropriate traffic management. The existing capped test bore hole is across the road from this site.

Borehole BHC at Overland Magum. This is an upstream western view of the riverbed with ash, sand, and boulders. The BHC site is immediately to the south of this area (right in picture). While the river is dry now, heavy rainfall can cause it to have a heavy flow to the sea. Care to be taken to minimize the flow of any wastewater of garbage into this riverbed.

Borehole BHC at Overland Magnum. View of Bailey Bridge as temporary crossing over the river after volcanic eruption and existing concrete road overtopped by river and lahar. Note riverbed underneath.

Borehole BHD Site at Overland Magnum. View looking down on proposed site where existing borehole is presently. Scrub vegetation and secondary growth present, coconut trees, with a number of fruit trees including West Indian plum, mango, banana.

Borehole BHD site at Overland Magnum. View of existing fenced area enclosing the capped existing test borehole. Site is flat. Note proximity of residents to the north across the riverbed. Existing Highway provided easy access to the site.

Borehole BHD site at Overland Magnum. Closer view of the existing fenced area enclosing the capped existing test borehole and proximity to high road.

Borehole BHD site at Overland Magnum. Concrete catchment pit constructed to capture runoff from overflowing waters from the previous borehole exercise. This is a control to reduce the effects of scouring and degrading the land in an uncontrolled manner.

Borehole BHD site at Overland Magnum. Closer view of concrete catchment or energy dissipator with entry and exit pvc pipes. Chamber will collect and allow some settling of water to reduce turbidity as well as reduce velocity before being released into river.

Borehole BHD site at Overland Magnum. View of residential community across the river and Baily bridge from the site.