MOTT MACDONALD

Geothermal Energy Development Project - Exploratory Test Drilling

Volume I - Non-technical summary

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Geothermal Energy Development Project - Exploratory Test Drilling

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Glossary of terms

Term	Definitions
Area of Influence (AOI)	The area where the Project's effects are expected to be noticed.
Biodiversity	All living things on land and in the water, including the environments they live in.
Chance find	Archaeological or cultural sites and artifacts such as historical or cultural treasures including pottery, tools, buildings, and burial sites. Sometimes, these items can be found during construction, even if we did not know about them before.
Consultation	Consultation is a two-way process of dialogue between the project company and the people or groups involved. Stakeholder consultation is about initiating and sustaining constructive communications and relationships over time.
Critical habitat	These are places in nature, like forests or wetlands, that are either in their natural state or have been changed but still support a lot of different and important plant and animal life. This includes the places that are crucial for the survival of species that are very close to disappearing or are already at risk.
Cultural heritage	Encompasses historical sites, groups of buildings, and museums that can have different meanings and values, including their symbolism, history, artistry, aesthetics, cultural significance, scientific importance, and their role in society. Cultural heritage includes things you can touch, like objects and buildings, as well as intangible cultural heritage that is connected to these tangible items.
Cumulative impacts	The combination of multiple impacts arising from existing projects or activities, and/or anticipated future projects or activities.
Direct area of influence	Considers the physical footprint of the project such as the right of way, construction sites, work staging area and area affected during operational works (e.g. traffic patterns).
Economic displacement	Loss of assets or access to assets that leads to loss of income sources or means of livelihood.
Ecosystem	The interacting system of a biological community and its non-living environmental surroundings.
Emission	Pollution discharged into the atmosphere.
Environmental and Social Impact Assessment (ESIA)	A forward-looking instrument that is able to proactively advise decision-makers on what might happen if a proposed activity is implemented. Impacts are changes that have environmental, political, economic, or social significance to society. Impacts may be positive or negative and may affect the environment, communities, human health and well-being, desired sustainability objectives, or a combination of these.
Environmental and Social Management Plan (ESMP)	Summarises the company’s commitments to address and mitigate risks and impacts identified as part of the ESIA, through avoidance, minimisation, and compensation/offset, and monitor these mitigation measures.
Geothermal exploration	Geothermal resource confirmation phase that can include surface studies, reconnaissance, exploration drilling, feasibility study and production phase ESIA.
Geothermal power generation	Involves drilling deep production wells into the Earth’s crust to harness the thermal energy contained in underground reservoirs of geothermal waters or steam.
Good International Industry Practice (GIIP)	Exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced

Term	Definitions
	professionals engaged in the same type of undertaking under the same or similar circumstances globally or regionally. The outcome of such exercise should be that the project employs the most appropriate technologies in the project-specific circumstances.
Greenhouse gases	The following six gases or class of gases: carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF6).
Geothermal power plant	Second of the two main components of the geothermal power plant process, where the extracted steam is used to generate electricity.
Grievance mechanism	Procedure provided by a project to receive and facilitate resolution of affected communities' concerns and grievances about the project's environmental and social performance.
Habitat	Terrestrial, freshwater, or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the non-living environment.
Hazardous waste	By-products of society that can pose a substantial or potential hazard to human health or the environment when improperly managed. Substances classified as hazardous wastes possess at least one of four characteristics—ignitability, corrosivity, reactivity, or toxicity— or appear on special lists.
Information disclosure	Disclosure means making information accessible to interested and affected parties (stakeholders). Communicating information in a manner that is understandable to stakeholders is an important first and ongoing step in the process of stakeholder engagement. Information should be disclosed in advance of all other engagement activities, from consultation and informed participation to negotiation and resolution of grievances. This will make engagement more constructive.
Invasive alien species	Non-native species of plants (flora) and animals (fauna) that are a significant threat to biodiversity due to their ability to spread rapidly and out-compete with species that naturally belong in an area.
Land acquisition	All methods of obtaining land for project purposes, which may include outright purchase, expropriation of property and acquisition of access rights, such as easements or rights of way.
Livelihood	Full range of means that individuals, families, and communities utilize to make a living, such as wage-based income, agriculture, fishing, foraging, other natural resource-based livelihoods, petty trade, and bartering.
Magnitude	The assessment of magnitude is undertaken in two steps. Firstly, the magnitude of potential impacts associated with the Project are categorised as beneficial or adverse. Secondly, the beneficial or adverse impacts are categorised as major, moderate, minor or negligible based on consideration of a number of parameters.
Natural habitat	Land and water areas where the biological communities are formed largely by native plant and animal species, and where human activity has not essentially modified the area's primary ecological functions.
Net gain (biodiversity)	Development that leaves biodiversity in a better state than before.
Occupational health and safety	The range of measures aimed at protecting workers from injury or illness associated with exposure to hazards in the workplace or while working.
Physical displacement	Relocation or loss of shelter.
Pollution	Refers to both hazardous and non-hazardous pollutants in the solid, liquid, or gaseous forms, and is intended to include other forms such as nuisance odours, noise, vibration, radiation, electromagnetic energy, and the creation of potential visual impacts including light.

Term	Definitions
Production	Steam field and power plant development phase that can include production drilling and development of steam above ground system (SAGS) and power plant.
Project affected people	Individuals, workers, groups or local communities which are or could be affected by the project, directly or indirectly, including through cumulative impacts.
Renewable energy	Energy sources derived from solar, hydro, wind, certain types of geothermal, and biomass.
Sensitivity	The sensitivity of affected people, natural resources, or physical features is determined based on the review of the population (including proximity / numbers / vulnerability), presence of biological features of the site and the surrounding area, soil, agricultural suitability, geology and geomorphology, proximity of aquifers and watercourses, existing air quality, presence of any archaeological features etc.
Significance	Significance of impact takes into account the interaction between the magnitude and sensitivity criteria.
Stakeholders	Persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project or the ability to influence its outcome, either positively or negatively.
Stakeholder Engagement Plan	A management tool to guide stakeholder engagement procedures and activities for a project.
Steam fields	First of the two main components of the geothermal power plant process, where the geothermal fluids are extracted, processed and subsequently re-injected.
World Bank Group EHS Guidelines	Technical reference documents for environmental protection and set out industry-specific examples of 'international good practice'. Projects are expected to comply with the levels and measures identified in the General EHS Guidelines where host country requirements are less stringent or do not exist.
International Finance Corporation Performance Standards on Environmental and Social Sustainability	The Performance Standards are directed towards clients, providing guidance on how to identify risks and impacts, are designed to help avoid, mitigate and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities.

1 Introduction and background

1.1 Overview

The purpose of this non-technical summary (NTS) is to present in a clear and simple manner the main findings and conclusions of the environmental and social impact assessment (ESIA) process undertaken for the Exploratory Test Drilling Phase of the Geothermal Energy Development Project (the Project).

The Government of Grenada (GoG) is working to make Grenada rely less on imported fossil fuels to generate electricity. The GoG is doing this by looking into and using more renewable energy sources. One potential source is geothermal energy, which comes from the heat inside the Earth. Preliminary investigations that have already been carried out suggest that there is good potential for geothermal energy in Grenada. However, this potential can only be confirmed by drilling exploratory test wells at the suggested locations of the geothermal energy sources.

1.2 What is the objective and scope of the ESIA?

Before starting the exploratory test drilling, Grenada national approvals and international funding are required. For this, the GoG needs to complete an ESIA in accordance with international standards.

The ESIA has been undertaken in accordance with GoG national laws, regulations and guidelines for environmental and social protection and the International Finance Corporation's (IFC) Performance Standards (PS), associated PS Guidance Notes, and the World Bank Group Environmental Health and Safety (EHS) Guidelines (2007).

The ESIA is organised as follows:

- Volume I – Non-Technical Summary (NTS) (this document)
- Volume II – Environmental and Social Impact Assessment (ESIA)
- Volume III – Stakeholder Engagement Plan (SEP)
- Volume IV – Livelihood Restoration Framework (LRF)
- Volume V – Environmental and Social Management Plan (ESMP)

Table 1.1 below shows the structure of the Volume II ESIA report.

Table 1.1: Structure of the Volume II (ESIA) report

No.	Chapter	Description of Content
1	Introduction	Presents a brief project overview, description of key stakeholders, and objective of the ESIA study and report
2	Project description	Describes the project, its main elements and activities for construction and operation
3	Project need and analysis of alternatives	Explains why the project is needed and its relevance for Grenada. It also provides an overview of the different options for generating energy and how the location has been selected. This includes looking at what would happen if the project did not go ahead at all.
4	Policy, legal and institutional framework	Defines key national policy, legislation and international lender guidelines applicable to the project, as well as key national institutions
5	Information disclosure,	Provides an overview of the consultation processes and results

No.	Chapter	Description of Content
	consultation and participation	
6	ESIA process and methodology	Sets out the stages of the ESIA, key assumptions and methodologies for undertaking the ESIA
7 – 16	Baseline, impact assessment and mitigation measures	Presents the current status of the environment, then provides an impact assessment and identifies measures to minimise adverse impacts and improve positive impacts for each of the following topics: ● 7 Socio-economic and cultural ● 8 Biodiversity ● 9 Water resources ● 10 Noise and vibration ● 11 Air quality ● 12 Landscape and visual ● 13 Traffic and transport ● 14 Waste and materials management ● 15 Geology soils and erosion ● 16 Cumulative impacts
17	Summary and conclusions	Presents a summary and the conclusions of the ESIA
18	References	Lists the bibliography consulted by the specialists during preparation of the ESIA

The exploration stage of the Project aims to confirm the existence of a geothermal resource suitable for power production. Therefore, this ESIA only considers the exploratory test drilling phase of the project. The power production phase is not within the scope of this ESIA which would be subject to its own ESIA process at a later stage if test drilling is successful.

1.3 Who is developing the Project?

The GoG is the Project developer and has been investigating potential geothermal sources on mainland Grenada.

The Project´s design has been developed by Jacobs New Zealand Limited (Jacobs).

The governments of Japan and New Zealand have helped by giving technical assistance, and the Caribbean Development Bank (CDB) is providing funds to support these efforts.

1.4 Project history and location of the Project

In 2015, responding to requests from GoG, the New Zealand Ministry for Foreign Affairs and Trade (MFAT) and Japan International Cooperation Agency (JICA) funded technical assistance (TA) to undertake preliminary exploration activities in Grenada which indicated the presence of underground geothermal reservoirs that could potentially support power generation. The TA activities included a pre-feasibility assessment, initial environmental and social analysis, and a preliminary drilling plan which was produced in 2016.

Seven locations were initially identified as possible drilling locations for deep slim hole exploration wells. This list was refined to a shortlist of three locations, following an initial assessment of water requirements and accessibility of the sites.

In 2016, Jacobs undertook an infrastructure assessment to confirm the feasibility of access to the three shortlisted areas. As part of this study, one of the key aspects identified was the provision of a reliable water supply. In 2018, Jacobs produced an Exploration Drilling Plan, Water Resources Assessment and Drilling Site Definition Report. The Drilling Site Definition Report) further refined the proposed drilling site options, detailed water requirements and well

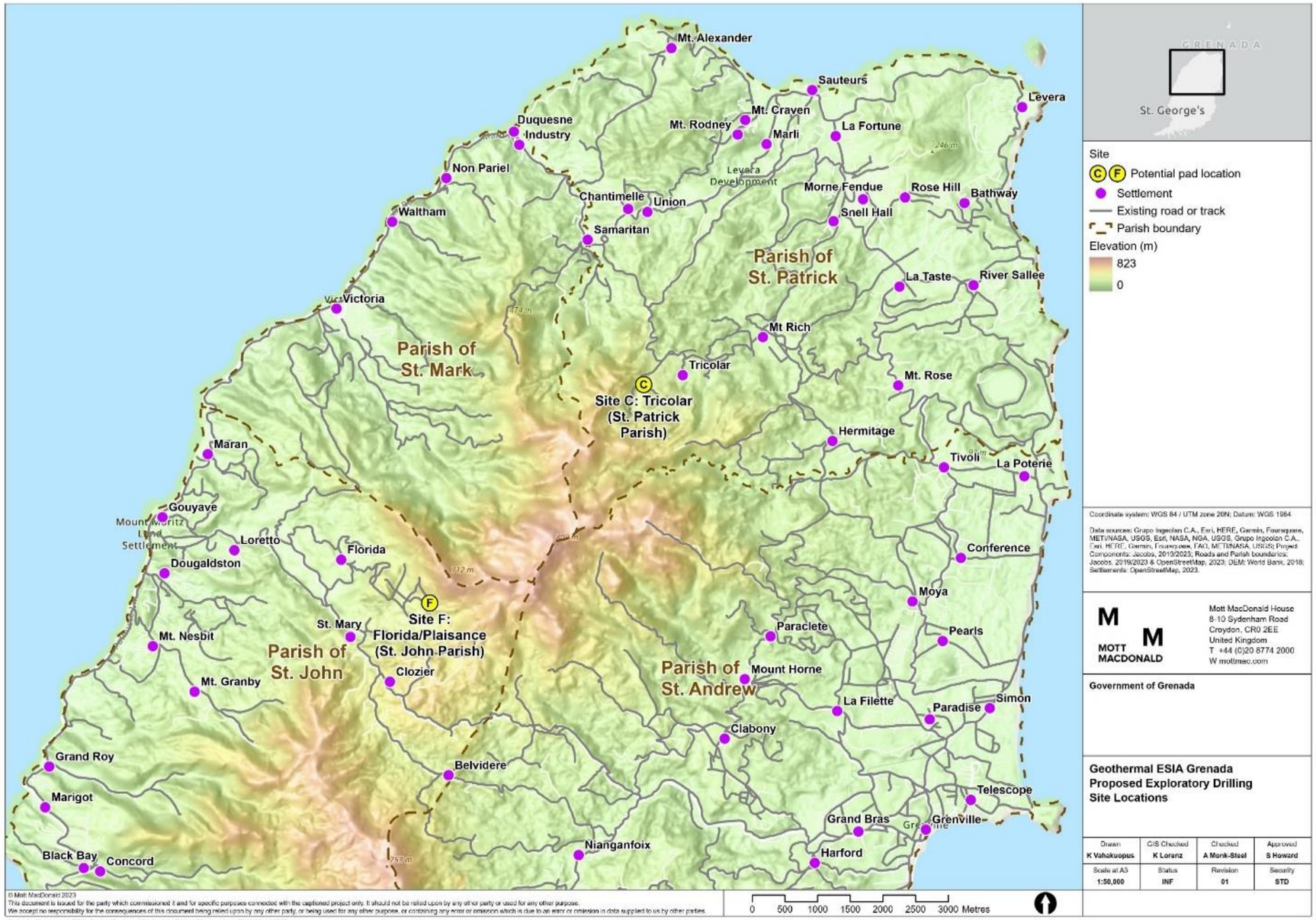
pad locations. The report identified four possible drilling locations (Site B: Castle Hill, Site C: Tricolar, Site D: Barique, Site F: Florida/Plaisance). Subsequent analysis narrowed down the two preferred sites to:

- Site C: Tricolar (St. Patrick Parish)
- Site F: Florida/Plaisance (St. John Parish)

Following the ESIA Scoping Consultation in 2019, further engineering review and analysis by Jacobs resulted in modifications to the proposed well pad at Site C (Tricolar).

The two selected exploratory drilling pad locations are identified in Figure 1.1. Site C (Tricolar), is located to the north-east of Mount St Catherine whilst Site F (Florida/Plaisance) is situated to the southwest of Mount St Catherine.

Figure 1.1: Proposed exploratory drilling site locations



Source: Mott MacDonald

1.5 Is there an opportunity to comment on the Project?

In addition to the consultation activities that have already occurred, public consultation meetings on the draft ESIA report are expected to occur in October 2023.

Following the public consultation meetings, the GoG will make the ESIA available via internet and in hard copy for review, so that and community members and other interested parties will be able to provide comments on the Project and the ESIA.

At any time (even after the disclosure period), if you would like to comment on the Project, you can contact the Community Liaison Officer (CLO) at:

Information	Details
CLO	Wendy Frederick
Address	c/o Energy Division The Carenage, St Georges, Grenada
Telephone	+1 473 435 8708
Email	clogrenadageothermal@gmail.com
Website	To be defined

2 The Project

2.1 Why is the Project needed?

Grenada is a tri-island state comprised of the islands of Grenada, Carriacou and Petite Martinique, with a total population of 124,610[1].

Grenada's total energy supply mix is made up of 98% fossil fuels and 2% renewables[2]. Grenada is currently almost entirely reliant on imported fossil fuels (diesel) for electricity generation, leaving it vulnerable to global oil price fluctuations that directly impact the cost of electricity. This global volatility in the price of oil has a strong impact on the retail price of electricity cost at the local market level.

If geothermal energy, is confirmed and utilised for large-scale power generation, this will provide a large quantity of continuous, reliable, renewable energy, which will:

- Significantly decrease Grenada's reliance on overseas fuel imports,
- Increase the diversity of energy sources in Grenada,
- Help to stabilise electricity prices, and
- Help to meet Grenada's ambitious renewable energy targets as set out in its 2023 National Energy Policy

2.2 Alternatives considered

All key stages of the Project have looked at alternative options including the "no project" option to seek to reach the most environmentally and socially beneficial project.

The "no project" alternative would result in:

- No additional information would be able to be collected on the feasibility of the geothermal potential in Grenada, and the question of whether Grenada has viable geothermal power potential would remain unanswered.
- Assuming that there is indeed viable potential, the no project alternative would prevent any such potential from being realised.
- This would be a barrier to the achievement of Grenada's renewable energy transition and would prolong the country's dependence on fossil fuels.

2.3 What is the Project?

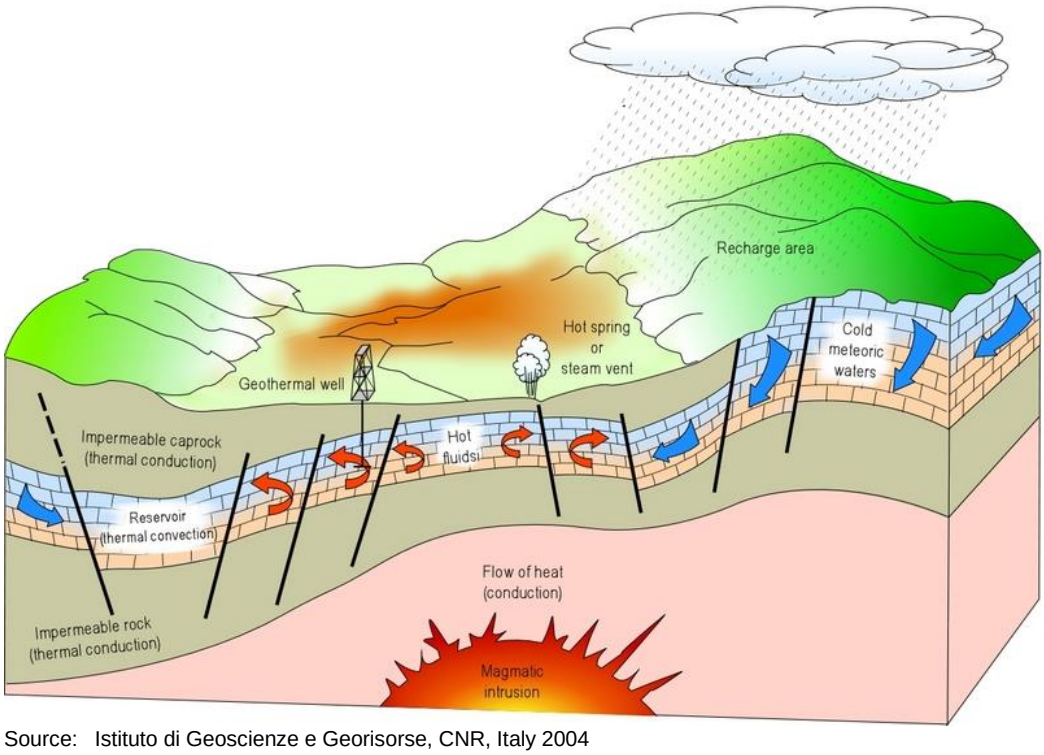
2.3.1 What is geothermal power?

Geothermal power generation involves drilling deep production and reinjection wells into the earth's crust to harness the thermal energy contained in existing underground reservoirs of geothermal water as outlined in Figure 2.1 below. These reservoirs are layers of permeable rock containing naturally-occurring volumes of water, sandwiched between layers of solid Impermeable) rock. These reservoirs may be located thousands of meters below the surface, and are heated by heat rising from below.

[1] Estimated number for 2021, Pan American Health Organization (PAHO), https://hia.paho.org/en/countries-22/grenada-country-profile, retrieved 11 April 2023

[2] Organización Latinoamericana de Energía (OLADE). 2021 Latin American and the Caribbean Energy Outlook. 2021. Available at: https://www.olade.org/en/publicaciones/panorama-energetico-de-america-latina-y-el-caribe-2021/. Accessed on 2 August 2023.

Figure 2.1: Indicative diagram of a geothermal energy source



Source: Istituto di Geoscienze e Georisorse, CNR, Italy 2004

The production wells bring high-pressure geothermal fluid (a mixture of water, dissolved gases and minerals and steam), to the surface where the steam can be separated and used to power steam turbines to produce electricity. Brine and condensate removed by the separators are returned via the reinjection wells to the reservoir. It is important to note that this is a completely different process to hydraulic fracturing or “fracking”, which is an extraction technique typically used for natural gas wells in which underground rock layers are deliberately fractured by pumping high-pressure fluids into holes drilled into the rock. No fracking techniques will be used for Grenada’s exploration drilling.

2.3.2 What will happen during Exploratory Drilling?

For the purposes of the ESIA, the exploration phase can be split into three key sub-phases defined as:

- Site establishment (construction phase – infrastructure works)
- Exploratory drilling (operations phase)
- Site closure (decommissioning phase)

The key project components of the exploratory drilling phase are listed below:

- Provision of access roads (construction of new ones and upgrade of existing ones as required)
- Construction of well pads and facilities (infrastructure), and the drilling of exploration wells at site C and drilling well pad site F
- Provision of water supply infrastructure for drilling

2.4 What is the planned Project schedule?

Infrastructure works (civil works) are expected to be implemented during June to December 2024.

Exploration drilling is expected to commence in the first quarter of 2025, with the completion date scheduled for July 2025.

2.5 What will happen at the end of the Project?

The site closure activities will be defined at the end of the Exploratory Drilling phase, depending on the results obtained at any given site. Two different site closure activities are defined:

- In the case that exploratory drilling confirms the existence of a geothermal resource suitable for power production, preparation for the next stage of the project would occur, all temporary equipment and temporary facilities (machinery, warehouses, temporary offices, portable latrines) will be removed, and the area cleared of materials and wastes. The wellhead will be secured and monitored.
- In the case that exploratory results are not favourable, decommissioning and abandonment of the well will occur, and site restoration activities will be implemented.

2.6 Will the Project induce seismicity?

No induced seismicity is considered to be a likely outcome, simply because the project will not be doing anything that is known to induce seismicity. Generally, induced seismicity has been observed to occur in some cases where geothermal projects employ Enhanced Geothermal Systems (EGS) technology (where hydraulic fracturing, or “fracking” is used by pumping fluids at extreme pressure to enhance or create artificial permeability in the rock layer). This practice has typically induced small magnitude events normally associated more with an annoyance factor rather than significant earthquakes. The Grenada exploratory drilling does not propose to use any EGS technology or any fracking-type practice.

2.7 What standards have been applied to the Project?

In Grenada, there are several government agencies which are responsible for overall land management and environmental protection and a full range of laws, regulations, policies, acts and decrees with the intention of providing the necessary legal framework for the different agencies dealing with these matters. The Project will be undertaken in accordance with all the international treaties and conventions ratified by Government of Grenada, including those related to biodiversity, climate change, species protection and labour rights.

The Project will also comply with international financial institutions lending requirements, including:

- IFC Performance Standards 2012
- World Bank General Environment, Health and Safety (EHS) Guidelines
- EHS Guidelines for Geothermal Power Generation
- World Bank Environmental and Social Framework

The Project also aims to meet good international industry practice (GIIP).

2.8 Can I apply for a job?

Yes, you can. But please note that the project will employ a relatively small number of workers (30-40) during the construction phase (approximately six months). For drilling and testing, jobs will be mostly occupied by highly specialised professionals of the geothermal energy industry.

Furthermore, residents of the areas where the sites are located will be prioritised for any applicable job positions that will be open during construction.

Therefore, due to the small number of jobs, short duration of construction, and given that priority will be given to area residents, if you do not live in Grenada we do not recommend that you move to the project area to apply for a job.

3 Managing environmental and social impacts

3.1 How was the Project assessed?

The main stages in the ESIA process are:

- Establishment of the baseline (current conditions of the environment and people around the proposed Project sites)
- Prediction of potential impacts (adverse and beneficial)
- Identification of mitigation measures to be included in the design and ongoing management to reduce the significance of those potential negative impacts and improve any beneficial impacts

We collected two types of information for the ESIA. The first one, it is called primary data which is directly collected from the source (through interviews with local people and environment surveys) and the second one is called secondary data, which is obtained from existing available research and published material. The assessment process was also supported by a public ESIA Scoping Consultation in July 2019 with local people and organisations to ensure that these views were considered.

The ESIA has looked at how the project might positively or negatively affect the environment and society at different stages of the project, including effects on people, effects on water and other physical features, and effects on the natural environment and resources.

Based on the Project activities and on the baseline, we have determined the significance of the impacts, according to the sensitivity of project affected persons/environment and the magnitude of impacts (for example, extension, nature, duration).

Where the ESIA found that the Project could cause significant impact, actions or procedures (referred to as “mitigation measures” in the ESIA) have been developed to avoid, reduce or otherwise mitigate the effects. A great number of potential impacts can either be avoided or reduced through mitigation; however, some impacts may be unavoidable.

A Project environmental and social management plan (ESMP) has been developed that includes all the mitigation measures identified in the ESIA and how these will be implemented by the contractors and the GoG.

3.2 How will people and the environment be affected?

3.2.1 Effects on people

Near Site C, the land is mostly used for growing nutmeg and mixed crops, as well as some patches of dense forest, pastures, and cultivated land. Visibility can be limited due to the dense vegetation surrounding the site.

Site F is gently sloped and bordered by a large, vegetated peak to the north. Views to the south are currently obstructed by an elevated area and tall vegetation. In the immediate vicinity of Site F, you will find a mix of cultivated nutmeg plots, various agricultural crops like cacao, coconut, and bananas, as well as both evergreen and semi-deciduous secondary forests, pastures, and cultivated land. Visibility is restricted in most directions because of the dense vegetation.

In the area around the well pads, most of the farmers are women, and many of them lease the land they use from landowners.

The most significant impact on the people in this area will be related to economic resettlement. The GoG has gathered evidence of land ownership for most private landowners, and as of July 2023, only three plots remain with uncertain ownership. The GoG is still determining the number of legal landowners and tenants.

For the project, a total of 67,892 m^2 (6.8 ha) of land will be needed for the well pads, road widening, and pump station. Out of this, 4,358 m^2 (0.4 ha) are owned by the government, and 63,534 m^2 (6.4 ha) are privately owned. Some people may be using the land informally without recognized titles. Those people who will lose access to land and lose their existing crops will be completely compensated by the GoG.

To address these changes, the GoG will develop a Livelihood Restoration Plan (LRP) once they have a clearer picture of land acquisition and displacement before construction begins. The LRP will identify all of the assets and people affected and outline how they will compensate those individuals. The goal of the LRP is to ensure that no one suffers an economic loss as a result of these changes.

While there will be changes in how the land is used, as well as some inconvenience from noise and dust, it is important to note that no significant negative impacts on people have been found. The changes will mainly affect a relatively small, isolated area and will not have widespread effects. The surrounding vegetation should help shield and minimise any noticeable changes.

As you move farther from the site, any alterations due to construction and vegetation removal will become less noticeable because other natural elements in the landscape filter and obscure the views. This also applies to any steam plumes that might appear during testing. Whether or not you see steam will depend on local weather conditions, like wind and visibility, at the time of testing.

The primary measures taken to address these concerns will include minimising vegetation clearance where possible and maintaining the site's appearance through good housekeeping practices. Additionally, best practices from the construction industry will be employed to reduce noise, dust, and traffic-related impacts, such as selection of low noise plant and equipment, placing barriers or shrouds close to the main sources of noise, dust suppression by dampening, no burning of waste, vegetating surfaces of stockpiled materials, and speed limits for trucks and managing traffic to prevent accidents.

There are no known areas of cultural heritage significance in the immediate vicinity of the project. However, as a precautionary measure, a Chance Finds Procedure will be put in place. This procedure is designed to manage any unexpected discoveries of archaeological remains or artifacts that may occur during earth works. It ensures that any such findings are appropriately handled and documented to protect cultural heritage.

The operation of the project will increase the supply of renewable electricity for Grenada. This will have national benefits for the economic development of the country.

3.2.2 Effects on physical features

The proposed project sites are situated at elevations of 355 meters above sea level (ASL) for Site C and 415 meters ASL for Site F. They are close to Mt. St. Catherine, an area characterised by lush vegetation and steep terrain.

As you move up the slopes of Mt. St. Catherine, you will find thick tropical vegetation. As you descend towards lower altitudes and near roads and small communities, you will see more agricultural activity and signs of human influence.

The current air quality in the area is good. The main anticipated sources of air emissions at both Site C and Site F will be the exhaust emissions from vehicles, generators needed to power the drilling equipment for the well and during the testing of the well once it has been completed. In terms of construction traffic movements, it is estimated that 10 trucks will visit each site per day during construction. The roads leading to the drill pads are not paved, so wind and the dust kicked up by vehicle tyres on the unpaved road are expected to be sources of dust emissions. Best practices from the construction industry will be employed to reduce dust emissions and new, well-maintained vehicles will be used. The generators will also be required to meet best practice emission requirements and monitoring of key pollutants during well testing will be required to monitor pollution levels for the safety of onsite workers and nearby receptors. Following the application of the mitigation measures there are not predicted to be any significant residual effects with regards to air quality.

Both well pad locations have Belmont clay loam soil, where water is the main force causing erosion. When the land is cleared of vegetation, especially on steep slopes with heavy rainfall, there is a risk of increased erosion and landslides. The project could potentially lead to more soil erosion, and this could have negative effects on rivers, biodiversity, and the local community.

The main mitigation measures will be to minimise where possible the amount of vegetation clearance, implement best practice sediment control measures, temporary and permanent drainage to control and direct water (including along tracks), and spill prevention and management.

Water quality in the permanent watercourses is good and the flow rates vary seasonally. The rivers are used locally for a variety of purposes including irrigation bathing and fishing, as well as public water supply. Groundwater quality is also good and there are several springs in the area that help to maintain river flows during the dry season (January to June), and which are used for public and commercial water supply (at Site F and Site C respectively). During the wet season (July to December) river flows increase significantly, particularly in the immediate aftermath of rainfall, when numerous, normally dry drainage channels become active. Periods of intense rainfall are not uncommon and can result in flash flooding of the narrow valleys in the project area.

Effects on water resources are not expected to be significant. Water for well drilling and testing will be taken from local streams in a managed way, to ensure that water supplies, aquatic ecology and amenity use of the streams are not adversely affected. Construction, exploration drilling and decommissioning works will be managed in accordance with best practice, so the risk to surface water and groundwater quality from ground disturbance and the use of construction materials or plant is small, and no greater than for any other construction project.

At Site C, the risk to groundwater is slightly higher, because of nearby springs that supply water used for commercial purposes. A study is therefore underway to investigate the potential effects of the project on groundwater quality and spring flow, and the results will be available later in 2023, alongside the final ESIA report.

The Site C pumping station would be located in an area that is already at risk of flooding. If flooding occurs there during any stage of the project, the presence of the pumping station within the floodplain could increase the risk that local properties would be flooded.

To ensure that flood risk is not increased by the Project, the Site C pumping station will be relocated in the final design to minimise its effect on floodwater; and if necessary, local flood protection measures will be put in place to protect vulnerable properties.

The waste generated by the project will be properly managed and, therefore, it will stay within the project site boundaries. However, if any contaminants or materials dug up from the ground need special disposal off-site or are not handled correctly, there is a chance they could

contaminate the groundwater or aquatic environment outside the project area. To minimize waste, the project will reduce, sort, reuse, and recycle as much as possible. The Project will also be careful with food waste, keeping it separate and enclosed to prevent pests and bad smells, and either compost it or dispose of it quickly.

3.2.3 Effects on the natural environment and resources

In the surroundings of the project, you can find various natural habitats. These diverse habitats contribute to the ecological richness of the study area, providing a variety of ecosystems and species diversity.

Construction activities at the project sites are not expected to directly impact protected areas. The nearest protected areas are the Grand Etang National Park and Forest Reserve, and the Mount Saint Catherine National Park and Forest Reserve, but the project sites are located outside of their boundaries. Likewise, impacts on protected views are not expected: while Site C may be visible from some small eastern areas of Mount St. Catherine, and Site F might be visible from some small areas in both Mount St. Catherine and Grand Etang, the main walking trails in the national park are situated further away from the project sites.

To mitigate impacts on natural habitats and species, the project will implement construction and operations ecological management plans (CEMP and OEMP), aimed at achieving no net loss of biodiversity. Therefore, the exploratory phase of the project is not likely to have significant residual impacts on natural habitats or species.

The primary impact on biodiversity features is expected to be the disturbance and displacement of highly sensitive terrestrial fauna during the construction and operation phases, which will be relatively short-term (three to six months). No other significant impacts on biodiversity features have been identified at this stage, but a Critical Habitat Assessment (CHA) will be conducted before any site disturbance to confirm this. If the project is found to be within an area of Critical Habitat, the management and monitoring of critical habitat feature removal and restoration will be carried out through the OEMP during the drilling and testing phase.

3.3 Cumulative impacts with other projects

The GoG has identified seven other major Grenada projects (present and probable future projects/developments) likely to occur at the same time as the project construction or drilling/testing (from 2023 to 2025). However, this ESIA has not identified the potential to generate a spatial or temporary crowding[3] from the combination of the project with these other developments.

3.4 General conclusions

When conducting exploratory drilling for geothermal energy, there will always be some level of negative effects on people and the environment. Although negative impacts have been identified for this project, these can be controlled and mitigated with management plans and through the implementation of good international industry practices, as detailed in the ESMP.

The Project is deemed able to be developed in accordance with national requirements and the applicable international standards.

[3] This occurs when many activities are carried out in the same area at the same time.