

*Environmental Project Brief*  
**PROPOSED 10MW DISTRIBUTED  
GENERATION CAPACITY IN HILL  
RUN, ST. CATHERINE**

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Submitted by:



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Submitted to: NATIONAL ENVIRONMENT & PLANNING AGENCY

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# ENVIRONMENTAL PROJECT BRIEF FOR THE PROPOSED 10MW DISTRIBUTED GENERATION CAPACITY IN HILL RUN, ST. CATHERINE

*Submitted to:*

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**January 2019**

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## 1.0 INTRODUCTION

### 1.1 PROJECT OVERVIEW

The Jamaica Public Service Company Limited (JPS), in keeping with its mandate to provide reliable electricity to its customers, is currently implementing a project to install 10MW of distributed generation capacity in Hill Run, St. Catherine. Specifically, the generation plant will be located at a poultry processing plant currently being built by Caribbean Broilers. The current distribution feeder in proximity to the location of the future facility, Tredegar 410, will not be able to handle the expected power demand. As a solution to accommodate the future power demand of the processing facility, JPS will be installing five (5) 2MW distributed generation (DG) units to supplement power from the existing feeder. Subsequently, the distribution network will be upgraded to supply a microgrid around the 10MW generation plant whenever the feeder experiences faults. Some of the existing conductors on the feeder will be replaced with larger conductors to safely handle the expected power flow.

In addition to supplying electricity to the feeder, steam will be provided to the poultry processing plant through the use of five (x5) heat recovery steam generators (HRSG) units and two (2) gas-fired boilers.

### 1.2 PURPOSE OF PROJECT BRIEF

The Natural Resources Conservation Authority Act (1991) and subsequent legislation and regulations stipulate that persons undertaking new developments, which fall within a prescribed category will require a permit. Licenses will be required for the discharge of trade or sewage effluent and for the construction or modification of facilities. The Application Process is managed by the National and Environmental Planning Agency (NEPA) and governed by the Permit and License System, a mechanism to ensure that all Jamaican facilities (developments), within the prescribed categories, meet required standards in order to minimize negative environmental effects.

As described further in Section 3.0, an applicant is required to complete an Application Form (for permit and or licence) for submission to the NEPA. The Permit Application Form (PAF) requires a description of the project as well as selected aspects of the existing biophysical and built environment into which the project will be placed. This Project Brief is submitted in conjunction with the corresponding PAF and aims to incorporate, at a minimum, the following information:

- Description of project (Section 2.0)
- Regulatory framework and requirements (Section 3.0)
- Existing biophysical and built environment (Section 4.0)
- Summary of potential Impacts (Section 5.0)

## 2.0 THE PROPOSED PROJECT

### 2.1 THE PROPONENT

#### 2.1.1 Company Overview

The **Jamaica Public Service Company Limited (JPS)** is an integrated electric utility company and the sole distributor of electricity in Jamaica. The company is engaged in the generation, transmission and distribution of electricity, and also purchases power from five independent power producers. JPS currently has just over 600,000 customers who are served by a workforce of approximately 1,704 employees. The company owns and operates: 4 power stations, 9 hydroelectric plants, 43 substations and approximately 14,000 kilometres of distribution and transmission lines.

Along with the provision of electricity, JPS is a key partner in national development. The company has a vibrant corporate social responsibility portfolio and makes significant contributions in the areas of education, health and sports. The company also has a strong environmental focus and carries out its operations in an environmentally friendly manner.

#### 2.1.2 History

JPS is a proud inheritor of a tradition that dates back to 1892, when Jamaica first received electricity. This placed Jamaica in the enviable position of being one of the first in the world to have electricity, and only thirteen years after American scientist Thomas Edison had invented the electric lamp. In that year, the first electricity service in the island was supplied by the Jamaica Electric Light Company from a plant at Gold Street, in Kingston. In 1897, another company, the West India Electric Company, established an office in Kingston at 151 Orange Street. They built the hydroelectric plant on the Rio Cobre River at Bog Walk, which consisted of three machines, each with the capacity to deliver over 300 kilowatts of energy. West India Electric not only extended electricity service to other areas, but also introduced a new element to the city scene – electric tramcars. Tramcars later replaced the horse drawn cabs, which had been providing public transport, and remained in service until 1948.

Early in 1907, a severe earthquake destroyed a section of Kingston, disrupting city life and public services. Following this, West India Electric leased the property and businesses of Jamaica Light & Power Company Ltd, successors to the Jamaica Electric Light Company and integrated the Gold Street station into the Bog Walk Supply system. This resulted in a significant improvement in the service available to customers. In the early days, several towns had their own electric companies; but through a process of consolidation, buy-outs and amalgamations, Jamaica Public Service Company Limited emerged and was registered in 1923. At that time, JPS had 3,928 customers, a far cry from today's customer base of over 585,000. JPS was granted an all-island franchise in 1966, and today remains the sole public supplier of electricity.

The nature of the ownership of JPS has changed several times throughout time. The company started out as a private company, owned by foreign shareholders. In 1970, the Government of Jamaica

acquired controlling interest. In 2001, ownership of JPS returned to private hands when Mirant Corporation, a US-based energy service provider acquired 80 percent of the company, with the Government retaining almost 20 percent. The remainder, amounting to less than 1 percent, is owned by a small group of shareholders. In 2007, Mirant sold its majority shares to Marubeni Caribbean Power Holdings (MCPH) Inc., a subsidiary of Marubeni Corporation of Japan. In early 2009 Abu Dhabi National Energy Company (TAQA) of the United Arab Emirates, joined Marubeni as co-owner of the Jamaica Public Service Co. Ltd. Majority shares were therefore jointly held by Marubeni TAQA Caribbean.

In the first quarter of 2011, TAQA withdrew from the partnership with Marubeni in the Caribbean, due to a change in its corporate strategy. TAQA signalled its intention to focus primarily on the power sector in the Middle East and North Africa region. In the second quarter of 2011, Korea East West Power (EWP) entered into a Purchase and Sale Agreement with Marubeni Corporation for joint ownership of majority shares (80%) in the company. The Government of Jamaica holds 19.9% of the Company's shares and a small group of minority shareholders own the remaining shares. Today, JPS continues to operate under the joint ownership arrangement, with a Board of Directors comprised of representatives of Government, Marubeni and EWP (Jamaica Public Service Company Limited (JPS), 2018).

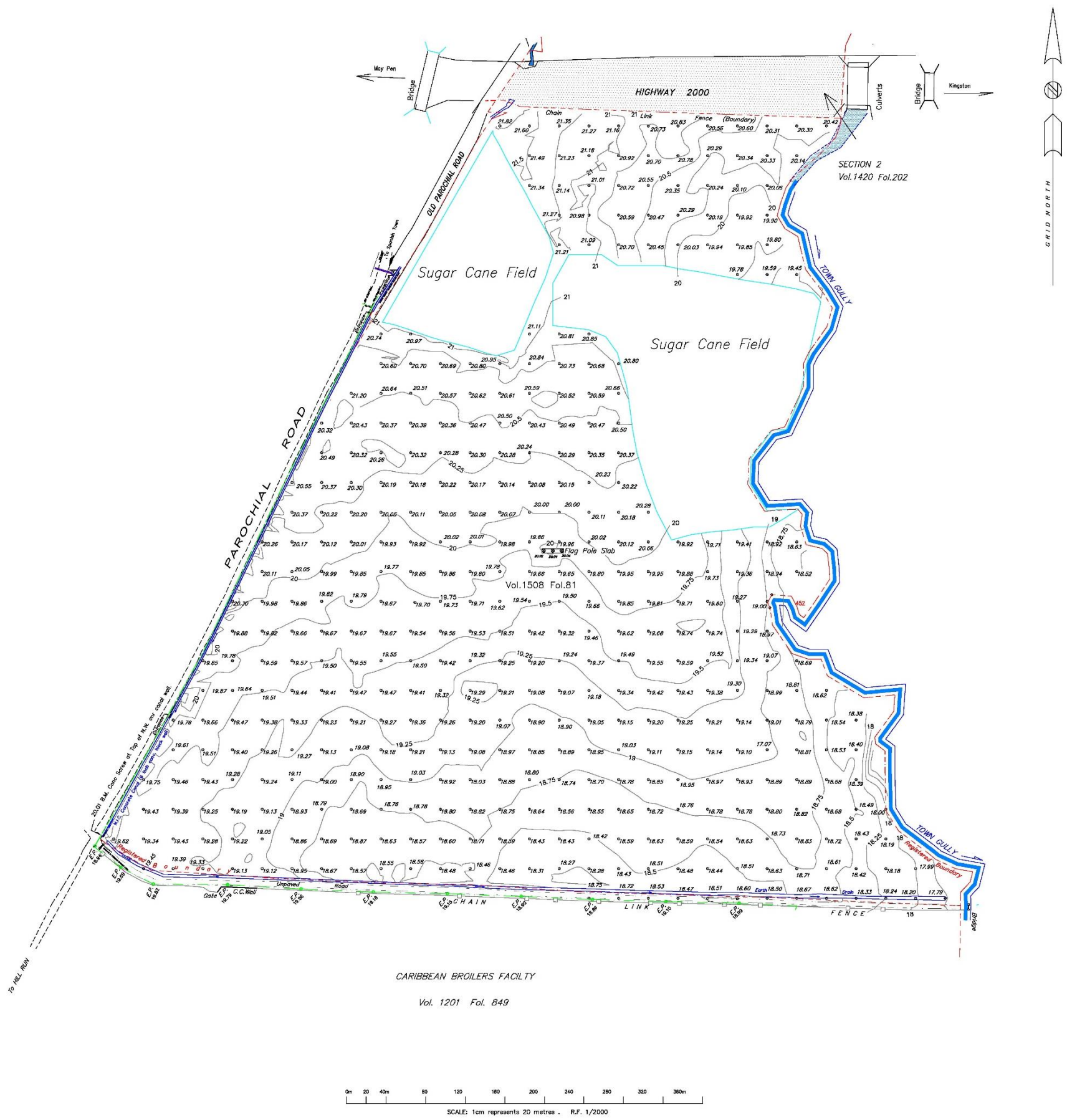
## 2.2 PROJECT LOCATION

The proposed installation of the 10MW distributed generation plant is located at "The Nest" just south of Spanish Town in Hill Run, St. Catherine (Figure 2-1). Caribbean Broilers (CB) is undergoing consolidating efforts and as part of this, its poultry processing facilities on Arnold Rd in Kingston will be relocated to the Hill Run property called "The Nest". When finished, the 1000-acre property will feature chicken processing, a livestock research centre, farms, and other activities.

The northern and western boundaries of the proposed land are paralleled by roadways, and specifically Highway 2000 and a parochial road respectively Figure 2-2. A gully runs along its eastern boundary and two cane fields are located in the northern half of the land parcel.



Figure 2-1 Location of proposed land, "The Nest" in Hill Run, St. Catherine



Notes:  
 Datum: Approximate M.S.L.  
 Contour Interval: 0.25m

REFERENCE

- ..... Wire Fence
- ..... Canal or Drain
- 19.22 ..... Spot Height (Assumed Datum)
- ..... Unpaved Road
- ..... Electric Pole & Powerline

TOPOGRAPHIC PLAN OF PART OF FELLOWSHIP HALL,  
 ST. CATHERINE, registered at Volume 1508 Folio 81

Surveyed by: C.C. Ramharrack B.Sc. C.L.S.  
 Date: September 2017

Figure 2-2 Topographic plan of proposed land, Hill Run, St. Catherine

## 2.3 DESCRIPTION OF THE PROPOSED FACILITY

### 2.3.1 Description of the DG Units

#### 2.3.1.1 Engine (Prime Mover)

The distributed generation plant to be built, own, and operated by JPS will utilize five (5) containerized 2MW distributed generation units (CAT CG170-20), each driven by a turbocharged natural gas internal combustion lean burning engine. Cooling of the engines will be achieved using a closed-loop glycol-based (35% glycol maximum) cooling system with radiators mounted on the top of each container. Engine exhaust will be muffled, passed through the heat recovery steam generator (HRSG) units, then ejected using exhaust stacks (tips more than 30' above ground) mounted on each HRSG unit.

#### 2.3.1.2 Generator (Alternator)

For each DG unit, electricity is generated using a three-phase synchronous generator driven at a nominal rotational speed of 1500 rpm by the natural gas engine. This generator, with nominal voltage of 440V is capable of producing ~2.5MVA at rated power (2MW) with a power factor of 0.8. During operation, the generator is cooled using an integral fan mounted on its shaft in accordance with the IC01 method of cooling. The 440V output from each generator will be stepped up to 24kV using transformers. Two 5MVA transformers will be each paired with two DG units and the remaining DG unit will be connected to a 2.5MVA transformer. All transformers will be pad mounted and air cooled externally with oil as the internal cooling medium (ONAN method of cooling).

#### 2.3.1.3 Fuel Requirements

Fuel for the generators will be supplied using pipes through the fence of the JPS site from a nearby Liquefied Natural Gas (LNG) supply facility to be built, owned, and operated by New Fortress Energy (NFE). At each DG unit fuel will be supplied using DN80 ( $\approx 7.6$  cm ( $\approx 3$ " ) diameter) pipes. The fuel will be stored in a liquid state using several LNG ISO tanks on the NFE compound. The liquid will be converted to gas using a vapourizer on the NFE compound before being sent to the JPS site underground. JPS will take responsibility for the gas at its site boundary. The specifications of the gas to be supplied to the JPS site is presented below:

- pressure: at least 80mbar
- pressure fluctuations:  $\pm 10\%$
- fluctuation frequency: less than 10 per hour
- temperature: at least 35°C
- methane number: 80

Natural gas will be the primary source of fuel for the DG units. In the event that the supply of LNG is compromised, the units are able to use propane gas.

#### 2.3.1.4 Cooling System Water Usage

The DG units feature a closed-loop glycol-based cooling system. Consequently, water will not be normally consumed during operation. After several years (number based on the level of degradation), the coolant will be replaced by maintenance personnel. Some specifications of the cooling system are presented below:

- glycol content: 35% maximum
- cooling output: 1009 kW
- cooling water temperature (inlet/outlet): 93/80 °C
- cooling water volume flow: 74 m<sup>3</sup>/h
- loss of pressure: 690 mbar
- Connection flange: DN100/PN10

#### 2.3.1.5 Lubrication System

The lubricating system consists of a fresh oil tank, engine oil pan, oil pumps, oil filter, lubricant heat exchanger, and connecting pipes. During normal operation, an oil gear pump circulates oil (at ~35L per minute) from the engine oil pan to the various engine components requiring lubrication. The oil is then pumped to the lubricant heat exchanger (integrated into engine cooling circuit) where it is cooled before returning to the oil pan. During maintenance, waste oil is pumped from the oil pan using a pre-lubrication pump to the waste oil tank. Fresh oil is then taken from the fresh oil tank and new oil is added to return the fresh oil tank to the required capacity. The fresh oil tank has a 1500L capacity, features overflow protection, is single-walled, and is made from steel sheeting (S235 JRG2). A single oil change is expected to occur once every three months. During each oil change, ~1000L of waste oil will be removed from each DG unit.

### 2.3.2 Steam Production

#### 2.3.2.1 Steam Generators

Steam will be produced using two (2) natural gas – fired boilers and three (3) HRSG units. Three DG units will be connected to a large 3x1 HRSG unit while the other two will each connect to a small 1x1 HRSG unit. This configuration will allow for the partial recovery of exhaust waste heat for steam production. From each 1x1 HRSG unit, steam will be supplied as is (varies with electricity load ratio) with a maximum capacity of ~1200 kg/h at a pressure of 10 bar. The 3x1 HRSG unit will have a maximum capacity of ~3,600 kg/h at a steam supply pressure of 10 bar. The boilers, one with a capacity of ~6000 kg/h and the other ~3,000 kg/h, will be configured as the secondary steam supply source to supplement the steam supplied from the HRSG units. Fuel for the boilers will be obtained from the nearby LNG supply facility and as is the case for the DG units, the boilers are able to use propane if LNG supply is compromised. Steam will be transferred from each HRSG unit to a common header using ≈5.1 cm (2") (for 1x1 HRSG) and ≈10.2 cm (4") (for 3x1 HRSG) overhead insulated pipes while steam supplied from each boiler will be connected to the same header using ≈10.2 cm – ≈15.2 cm (4"-6") insulated pipes. From the common header, steam will be transferred to

the processing plant using an overhead  $\approx 20.3$  cm -  $\approx 25.4$  cm (8"-10") insulated pipe. The exhaust from all HRSG units and boilers will be ejected to the atmosphere using stacks with a minimum tip height of 30' (total of ten stacks).

### **2.3.2.2 Water Treatment**

Water will be obtained from Caribbean Broilers using an underground pipe of diameter 2". This water will be treated (filtered and softened) by Caribbean Broilers before being sent to a second water treatment system on the JPS property. This water treatment system will primarily include a water softener (ion-exchange) and deaerator. The deaerator will include a chemical injection system to insert anti-scaling, anti-corrosion, and coagulants into the water before it is allowed to enter the boilers and HRSG units. Servicing of all steam system components will be contracted to a third party.

## **2.3.3 Substation**

### **2.3.3.1 Overview of Design**

The substation for the DG plant will consist of 24kW switchgear as well as two 5MVA transformers with one 2.5MVA transformer. The design of the substation features a single area with required 24kV switchgear and one 2.5 MVA transformer. The other two transformers (5 MVA each) are located in close proximity to the DG units. The secondary side of all transformers will be coupled and interconnected to the nearby 24kV distribution feeder line using poles and aluminium conductors.

### **2.3.3.2 Transformers**

All transformers will be of the same voltage rating (440V/254V GRDY: 24kV/13.8kV GRDY), be dead front pad-mounted types, and utilize the ONAN method of cooling i.e, internal oil-based coolant with natural convective cooling and external fins to facilitate natural air cooling (no fans/pumps). Some other transformer specifications are provided below:

- BIL high voltage winding: 30kV
- BIL low voltage winding: 150kV
- PCB content of Oil: <2ppm
- Oil Volume: not known
- Noise Level: 65 dB (distance not provided)

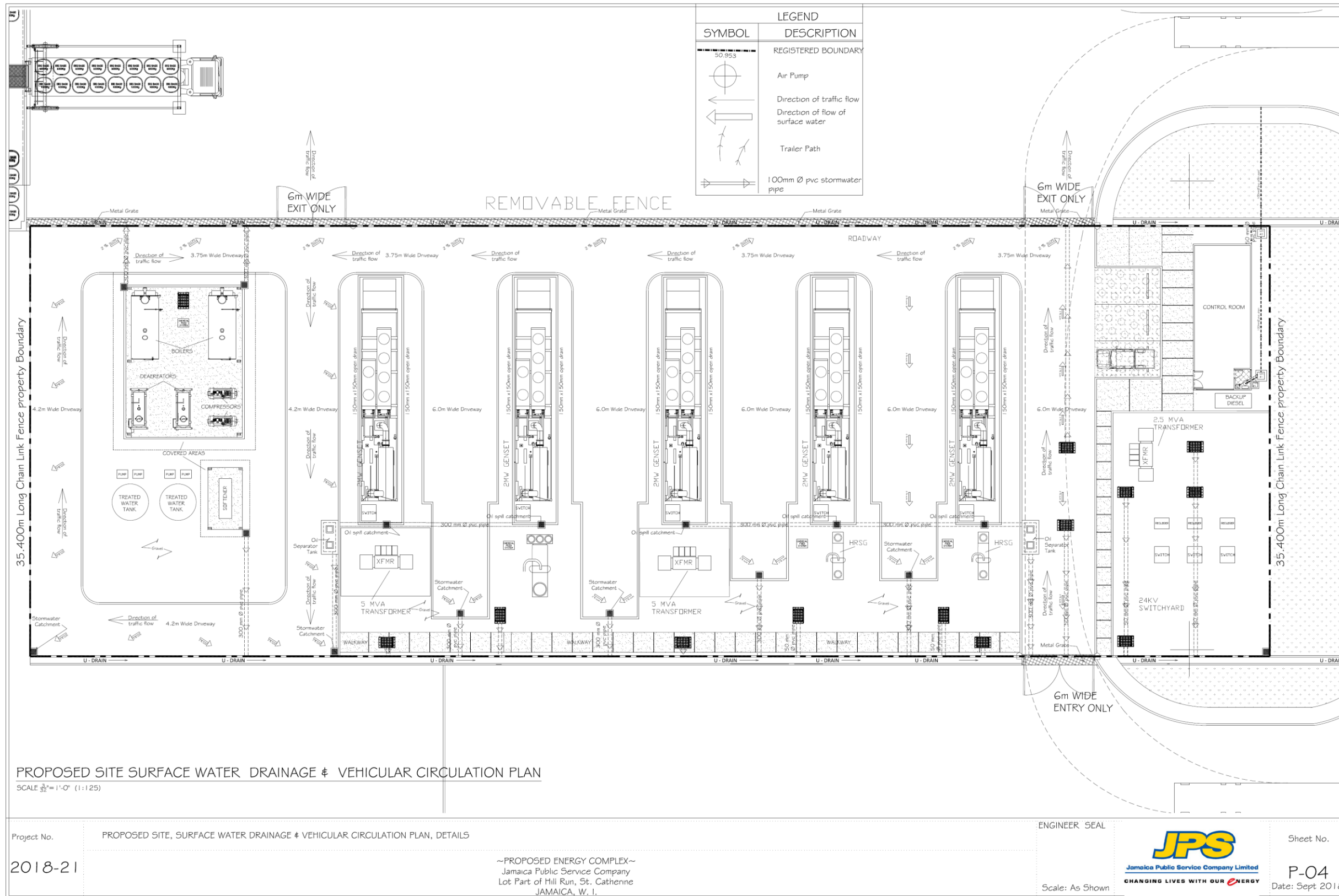


Figure 2-3 Overall equipment layout with auxiliary boilers

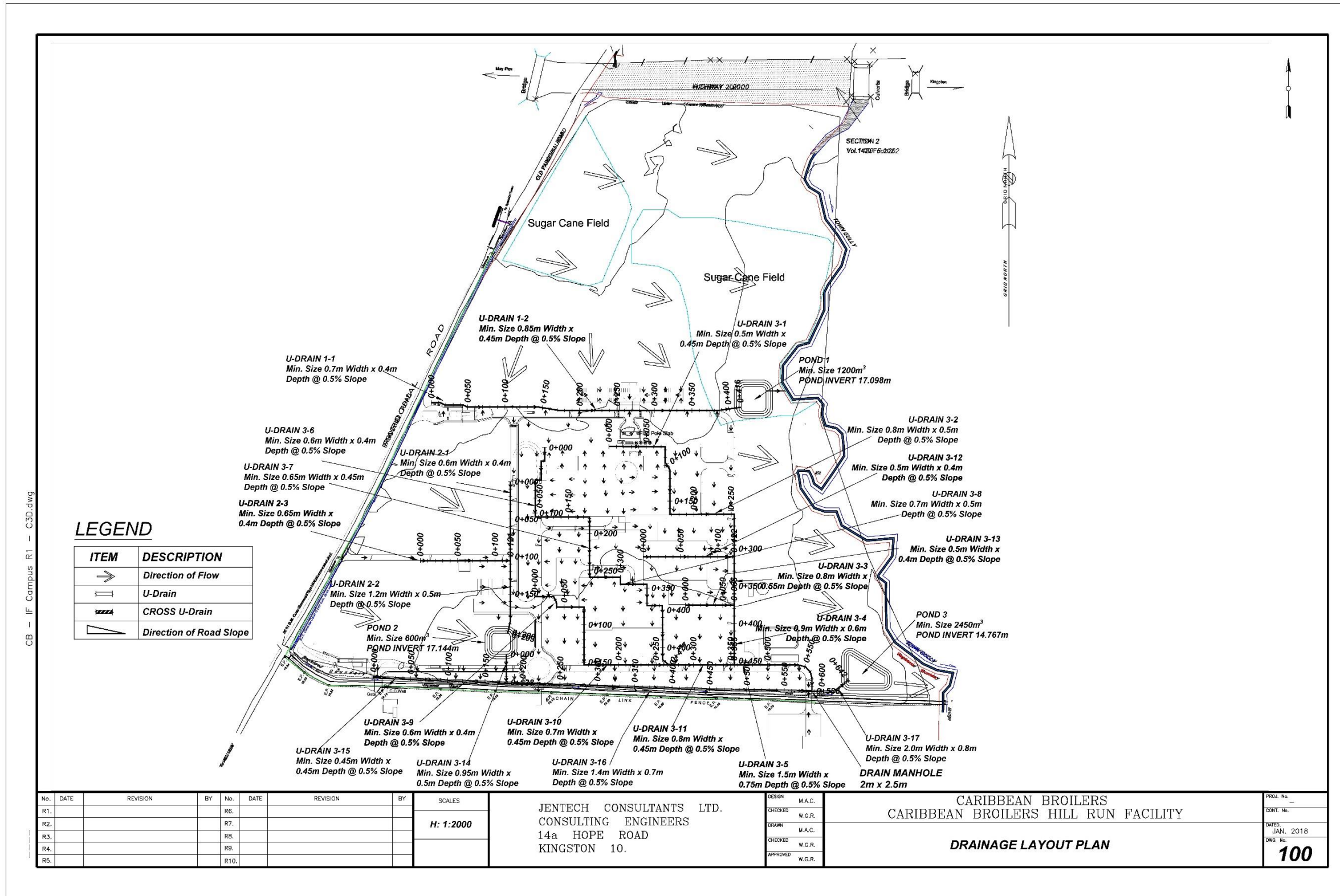


Figure 2-4 Drainage layout plan at proposed site

## 2.3.4 Fire Plan

### 2.3.4.1 Site Description

This fire plan describes the fire detection and suppression system to be used at the Tredegar 410 Distributed Generation (DG) plant. The location of said plant is a poultry-processing facility currently under construction by Caribbean Broilers in Hill Run, St. Catherine. The DG plant will consist of:

- five (5) containerized generators (2MW each) which will be fuelled with natural gas from an adjacent liquefied natural gas (LNG) supply facility
- three (3) transformers (x2 5MVA and x1 2.5MVA) which will step up voltage from 440V to 24kV
- 24kV switchgear (reclosers/breakers, switches, protection system, etc.)
- three (3) heat recovery steam generators (HRSG)
- fluid piping circuits and power cables which will feature both underground and above-ground runs.

The DG plant will supply power directly to the 24kV feeder (grid) from which the poultry-processing facility will receive power. In the event of a grid-failure, the DG plant will supply power to an isolated section of the 24kV feeder (microgrid) to supply power to as many customers as possible including the poultry-processing plant.

### 2.3.4.2 Applicable Standards and Regulations

The following regulations, references, and National Fire Protection Association (NFPA) standards apply to the DG plant and as such will be used in determining the fire protection requirements:

1. FM Global data sheet
2. Jamaica Fire Brigade
3. National Building Code
4. International Fire Code
5. Occupational Safety and Health Administration (OSHA)
6. National Fire Protection Association (NFPA)
  - a. NFPA 101, 2015 Edition – Life Safety Code
  - b. NFPA 850, 2010 Edition – Recommended Practice for Fire Protection for Electric Generation Plants and High Voltage Direct Current Converter Stations.
  - c. NFPA 13, 2013 Edition – Standard for the installation of Sprinkler Systems.
  - d. NFPA 14, 2010 Edition – Standard for the Installation Standpipe and Hose Systems
  - e. NFPA 15, 2012 Edition – Standard for Water Spray Fixed Systems for Fire Protection
  - f. NFPA 20, 2013 Edition – Standard for the Installation of Stationary Pumps for Fire Protection
  - g. NFPA 72, 2016 Edition – National Fire alarm and Signalling Code
  - h. NFPA 2001, 2010 Edition – Standard for Clean Agent Fire Extinguishing Systems

### **2.3.4.3 Fire Detection**

Each containerized DG unit has a built-in fire warning system to provide audible and visual alerts of fires (both smouldering and open) through the use of smoke detectors/switches and a temperature sensor. An external horn provides a loud auditory warning (108 dB) while several flashing lights provide a visible warning. The smoke switch features a contamination indicator, potential-free opener, communication capabilities, tracking of alarm thresholds, and monitoring of measurement chamber. In addition to the factory-integrated fire detection system, gas detectors, flame detectors, smoke detectors, manual pull stations, horns, strobes, will be installed strategically on the entire compound and connected to a general fire alarm system.

### **2.3.4.4 Fire Suppression**

Fire suppression will be achieved through the use of water, carbon dioxide, dry chemical powder, and clean agent fire suppression systems for the engine compartments, transformers and switchgear (substation), and general compound. Water, originating from nearby wells, will be obtained from the poultry-processing plant through an underground pipe. The suppression systems mentioned will neither cause any contaminant to pollute the water wells nor cause significant air pollution.

## **2.3.5 Wastewater and Storm water**

During normal operation, all sewage from the containerized site office will be piped to the Caribbean Broilers waste water treatment system to be constructed. In addition to this, all wastewater from the steam generation system (mostly from blowdown) will be sent to the same facility for treatment. Storm water from site grounds will also be piped/directed to the Caribbean Broilers waste water treatment system to be constructed.

## **2.4 PROJECT PHASES**

### **2.4.1 Construction Activities**

The major construction activities which will take place include:

1. Site preparation
  - i. removal of vegetation
  - ii. site grading
2. Civil works
  - i. Constructing concrete plinth foundations for DG units, transformers, boilers, HRSG units, and other major components.
  - ii. constructing underground trenches to accommodate power and communication cables
  - iii. drainage construction
  - iv. internal roadway construction
3. Major equipment installation, interconnection, and commissioning

- i. installation of DG units, transformers, poles, 24kV switchgear, boilers, HRSG units, exhaust stacks, water treatment system, containerized site office
- ii. interconnection and commissioning of electrical equipment
- iii. interconnection and commissioning of steam system components

During construction, portable toilets and portable water stations will be used. Based on the intended approach, equipment will be transported to the site when needed and so a large laydown area is not required. The JPS property will be used for equipment and material laydown.

## 2.4.2 Operations and Maintenance

The operations of the facility (both steam and electricity equipment) will be the responsibility of in-house plant operators working in shifts over a 24-hour period. Tasks of the operators will include scheduled system components inspections, monitoring, reporting and logging issues, and carrying out directives. The maintenance of the DG units will be contracted to a third party who will act based on an agreed schedule. Similarly, maintenance of the steam system will be contracted to a third party. The plant operators will be responsible for the periodic water quality testing and blowdown of the boilers and HRSG units.

## 2.4.3 Closure Plan

The DG plant is expected to have a service life of 15-20 years. At the end of the service life, JPS can choose to upgrade the plant with modern equipment and continue operations. If it is not beneficial to continue operation, then the plant will be closed, and lease terminated subsequently. Upon the closure of the DG plant, equipment will be reused where possible, materials recycled where possible, and all materials which can't be recycled or reused feasibly, will be disposed of in an environmentally friendly manner. After the site has been cleared, vegetation will be allowed to populate the area subsequent to being handed over back to Caribbean Broilers.

## 3.0 LEGISLATIVE FRAMEWORK AND REQUIREMENTS

### 3.1 DEVELOPMENT APPLICATION

#### 3.1.1 National Environment and Planning Agency (NEPA)

The National Environment and Planning Agency (NEPA) represents a merger of the Natural Resources Conservation Authority (NRCA), the Town Planning Department (TPD) and the Land Development and Utilization Commission (LDUC). Among the reasons for this merger was the streamlining of the planning application process in Jamaica.

NEPA has been given responsibility for environmental management in Jamaica under the Natural Resources Conservation Authority Act (NRCA) Act of 1991. Under the NRCA Act of 1991, the NRCA has the authority to issue, suspend and revoke environmental permits and licenses, as well as the power to request EIAs for a permit or for any activity in a prescribed area (entire island of Jamaica) where it is of the opinion that the environment is likely to have adverse effects due to the activities.

#### 3.1.2 General Procedures

##### 3.1.2.1 Permit and Licences

Under the Natural Resources Conservation Authority P & L Regulations 1996 (Amended 2015), an application for new developments, which fall within a prescribed category will require a permit. The Environmental Permit and License System (P&L) is administered by NEPA through the Applications Section. It was introduced in 1997 to ensure that all developments meet required standards and negative environmental impacts are minimized.

The NRCA permit procedure is initiated by the submission of the Permit Application Form (PAF) to the Authority. The form is reviewed to determine whether an EIA is required and to begin determining areas of environmental significance, especially in waste discharge.

##### 3.1.2.2 Environmental Impact Assessment

Based on the review of the PAF, the NRCA advises if an EIA would be required for the proposed project and determines the scope of the EIA through proposed Terms of Reference (TORs). The TORs are proposed using NRCA guidelines and are ultimately approved by the NRCA.

The NRCA guidance on EIAs states that this process “should involve some level of stakeholder consultation in either focus groups or using structured questionnaires.” A draft EIA is submitted to the developer to solicit the proponents’ input into the description of the project (to check for accuracy of statements, and to enter into realistic discussions on the analysis of alternatives, as well as to inform the proponents of any other relevant legislation with which they must comply). Fourteen copies of the finalised draft are then submitted to NRCA, two to the client, and the consultant keeps one (17 in all

are produced). The NRCA distributes these to various other public sector institutions who sit on the Technical Committee (e.g. Water Resources Authority (WRA), Environmental Control Division in the Ministry of Health (ECD), Jamaica National Heritage Trust (JNHT)) for their comments. Typically, this depends on the nature of the project.

As deemed necessary by the NRCA, Public Meeting(s) are held following the deposition of the Draft EIA at Parish Libraries (by the NRCA). A verbatim report of the public meetings is required, as well as a summary report of the main stakeholder responses which emerged. The comments of the NRCA, the other GOJ interests and the public are compiled and submitted in writing to the consultant not only for finalisation of the report, but for incorporation into the development's design. The NRCA then reviews this report again, and if further clarifications are needed, these are again requested. Once the NRCA is satisfied, the EIA is submitted to the Technical Committee of the NRCA Board for final approval. If the EIA is not approved, the proponents may appeal to the Office of the Prime Minister.

### 3.1.3 Project-specific Details

An application for the installation of the proposed 10MW Distributed Generation Facility is required under the Natural Resources Conservation Authority P & L Regulations 1996 (Amended 2015). As mentioned previously this Project Brief is being submitted in conjunction with a PAF.

## 3.2 REGULATORY REQUIREMENTS AND GUIDELINES

Several national and international standards, regulations, codes, guidelines and conventions exist and in addition to NEPA, various national agencies and government departments also have regulations that may have relevance to the operations of the power sector. Based on the proposed energy solution of 10MW of distributed generation capacity, all known existing legislative instruments were assessed for applicability; those that are deemed relevant are listed below, and a few described in further detail in subsequent sections:

- **NATIONAL**
  - ***Natural Gas (NG) and Liquefied Natural Gas (LNG) Infrastructure (Section)***
    - 1) Guidelines and Planning Standards – Gas Pipelines and Regulating & Metering Stations 2015
    - 2) Guidelines and Planning Standards – LNG Satellite Plants 2015
    - 3) Guidelines and Planning Standards – Regasification Terminals 2015
    - 4) Guidelines for Developing a Natural Gas Sector Regulatory Framework 2015
  - ***Development Control***
    - 5) Town and Country Planning Act (TCP Act), 1957 (Amended 1987) (Section)
    - 6) Parish Councils Act 1901 (Amended 2007)
    - 7) Land Development and Utilization Act 1966
    - 8) Local Improvement Act 1944
    - 9) Registration of Titles Act 1989
    - 10) Land Acquisition Act 1947

- 11) Building Act 2016
- 12) Vision 2030 and National Energy Policy (Section)
- **Environmental Conservation**
  - 13) Protected Areas System Master Plan: Jamaica 2013 – 2017 (Section)
  - 14) Policy for the National System of Protected Areas 1997
  - 15) Natural Resources Conservation Authority Act 1991
    - a. The Natural Resources (Permit and Licences) Regulations 1996 and (Amendment) Regulations 2015
    - b. The Natural Resources (Hazardous Waste) (Control of Transboundary Movement) Regulations 2003
    - c. The Natural Resources (Prescribed Areas) (Prohibition of Categories of Enterprise, Construction and Development) Order 1996 and (Amendment) Order 2015
  - 16) Wild Life Protection Act 1945 and Wild Life Protection (Amendment of Second and Third Schedules) Regulations 2016
  - 17) The Forest Act 1996
  - 18) The Endangered Species (Protection, Conservation and Regulation of Trade) Act 2000 (Amended 2015)
  - 19) Water Resources Act 1995
  - 20) The Jamaica National Heritage Trust Act 1985
- **Public Health & Waste Management**
  - 21) Water Quality Standards
  - 22) Noise Abatement Act 1997
  - 23) The Natural Resources Conservation Authority (Air Quality) Regulations, 2002
  - 24) The Clean Air Act 1964
  - 25) Public Health Act 1985
  - 26) The National Solid Waste Management Authority Act 2001
  - 27) Draft National Environment Management Systems (EMS) Policy and Strategy
  - 28) Draft National Implementation Plan for Persistent Organic Pollutants (POPs) – polychlorinated biphenyls (PCBs) Management
- **REGIONAL AND INTERNATIONAL LEGISLATIVE AND REGULATORY CONSIDERATIONS**
  - **Reference International Guidelines/Standards**
    - 1) Equator Principle Requirements
    - 2) IFC Performance Standards on Social and Environmental Sustainability
    - 3) World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines)
    - 4) National Fire Protection Association (NFPA) 59A
  - **International Conventions**
    - 5) United Nations Convention on Biological Diversity
    - 6) International Convention on Oil Pollution Preparedness, Response and Co-operation 1990
    - 7) Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal 1992

### 3.2.1 Natural Gas (NG) and Liquefied Natural Gas (LNG) Infrastructure

The following guidelines pertaining to NG and LNG were prepared by NEPA in May 2015:

- **Guidelines and Planning Standards – Gas Pipelines and Regulating & Metering Stations 2015**
- **Guidelines and Planning Standards – LNG Satellite Plants 2015**
- **Guidelines and Planning Standards – Regasification Terminals 2015**
- **Guidelines for Developing a Natural Gas Sector Regulatory Framework 2015**

These documents were developed according to the structure of different chapters of Volume 1 Section 1 of the Development and Investment Manual of the Government of Jamaica. Each of the below set of guidelines will be part of a final set of technical documents. Common to all documents are sections pertaining to site planning considerations, types of application and procedure and type of standards (including those related to access, parking, setbacks, installations, landscaping, drainage and Self-Protection and Emergency Plan).

### 3.2.2 Development Control

#### 3.2.2.1 Town and Country Planning Act (TCP Act), 1957 (Amended 1987)

The Town and Country Planning Act (TCP Act) 1957 (Amended 1987) provides the statutory requirements for the orderly development of land through planning, as well as guidelines for the preparation of Development Orders. A Development Order is a legal document which is used to guide development in the area to which it applies and the TCP Act is only applicable in an area where a Development Order exists. It constitutes land use zoning map/s, policy statements and standards relating to land use activities. Tree Preservation Areas and Conservation Areas (as specified areas the gazetted Development Orders) are two types of protected areas associated this Act.

The Town and Country Planning Act also establishes the Town and Country Planning Authority, which in conjunction with the Local Planning Authorities (LPAs), also referred to as Municipal Corporations and previously Parish Councils, are responsible for land use zoning and planning regulations as described in their local Development Orders. All development applications are made through the LPA which include enquiries, planning, building and subdivision approvals. The TCP Act is also administered by the National Environment and Planning Agency. Applications reviewed by NEPA include enquiries, planning applications, and building and subdivision applications.

As seen in Figure 3-1, the proposed project location falls within the boundaries of the St. Catherine Coast Development Order 1964. The proposed area for development is not zoned for any purpose. The local planning authority for the development is the St. Catherine Municipal Corporation, formerly the St. Catherine Parish Council.

Under this Act, the proponent will need to obtain a Building Permit for the proposed project.

### 3.2.2.2 Office of Utilities Regulation (OUR) Act 1995 (Amended 2000)

This Act was promulgated in 1995. Under this legislation, the OUR receives and processes applications for a licence to provide a prescribed utility service and make such recommendations to the Minister in relation to the application as the Office considers necessary or desirable. In relation to environmental management and protection, the OUR may, where it considers necessary, give directions to any licensee or specified organization with a view to ensuring that the prescribed utility service operates efficiently and, in a manner, designed to:

1. Protect the health and well-being of users of the service and such elements of the public as would normally be expected to be affected by its operation;
2. Protect and preserve the environment; and
3. Afford to its consumers economical and reliable service.

### 3.2.2.3 Vision 2030 and National Energy Policy

Vision 2030 is a National Development Plan for Jamaica, promoting four National Goals as well as associated National Outcomes for each goal, to be achieved by 2030, with the objective of developing Jamaica into a country with a vibrant and sustainable economy, society and environment; a high level of human capital development; greater opportunities and access to these opportunities for the population; and a high level of human security. Of the aforementioned outcomes, two apply directly to the proposed project:

- National Outcome 10: Energy Security and Efficiency (under Goal 3: “Jamaica’s Economy is prosperous.”) and;
- National Outcome 13: Sustainable Management and Use of Environmental and Natural Resources (under Goal 4: “Jamaica has a healthy natural environment.”)

The outcomes outlined above are incorporated in the proposed project by directly increasing the country’s energy efficiency, as well as considering environmental repercussions and outlining mitigation activities throughout the development of this plant. In further accordance with Vision 2030, the proposed development also aligns with the Ministry of Energy and Mining’s National Energy Policy, created under the umbrella of Vision 2030. The National Energy Policy seeks to develop a modern, efficient, diversified and environmentally sustainable energy sector providing affordable and accessible energy supplies, with long-term energy security and supported by informed public behaviour on energy issues and an appropriate policy, regulatory and institutional framework.

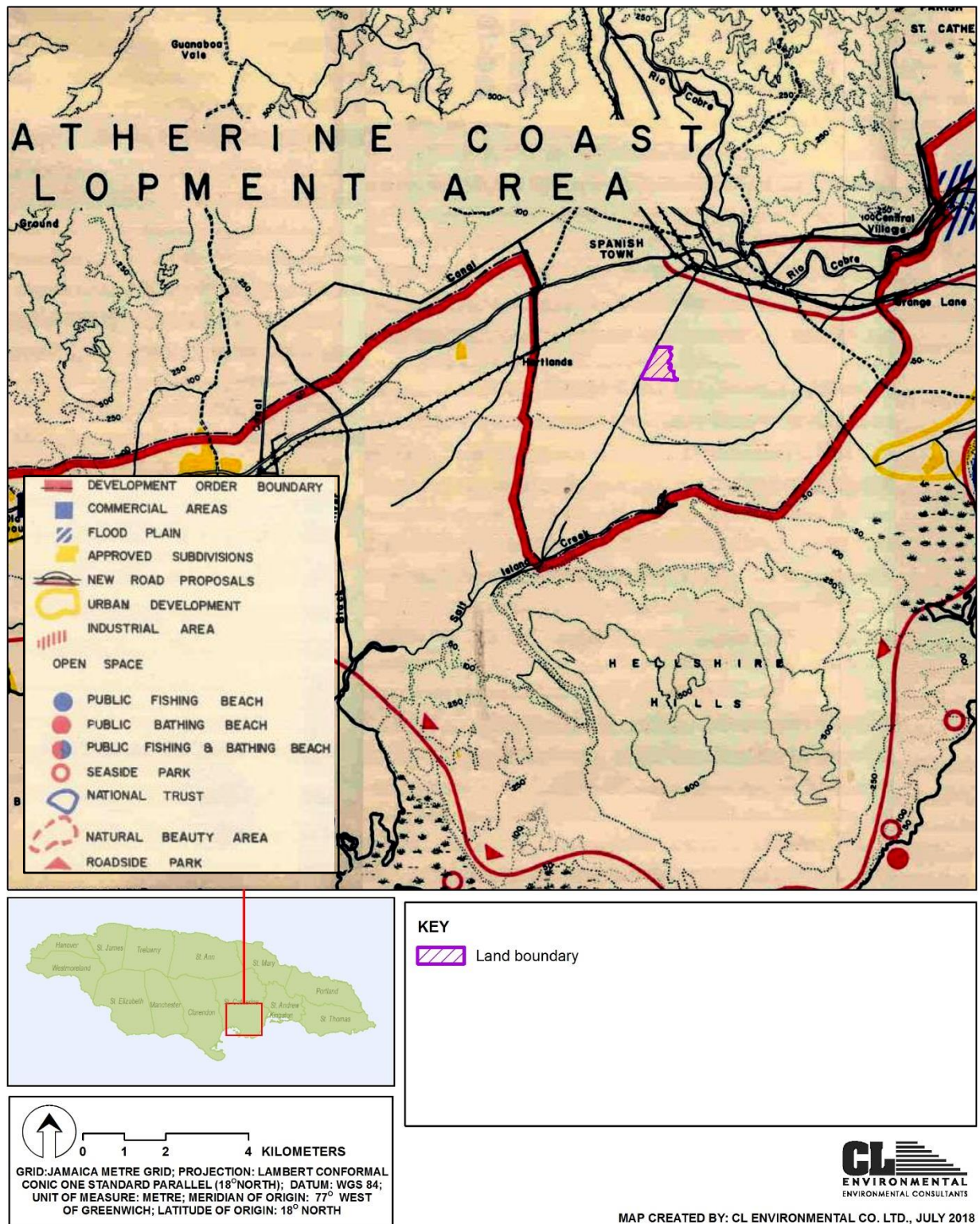


Figure 3-1 St. Catherine Coast Development Area

### 3.2.3 System of Protected Areas

The Protected Areas System Master Plan (PASMP) (2013 – 2017) sets out guidelines for establishing and managing a comprehensive system of protected areas that supports national development (National Environment and Planning Agency, n.d.). Existing protected area categories in Jamaica are listed in Table 3-1, Table 3-2 and Table 3-3.

**Table 3-1 Existing categories of protected areas in Jamaica (January 2012) - protected area system categories**

Source: (National Environment and Planning Agency, n.d.)

CATEGORY	RESPONSIBLE AGENCY	LAW
Protected Area	Forestry Department: Water, Land, Environment and Climate Change (MWLECC)	Forest Act, 1996 and Forest Regulations
	National Environment and Planning Agency: MWLECC	NRCA Act, 1991
	NEPA: MWLECC	Beach Control Act, 1956
National Park	NEPA: MWLECC	NRCA Act, 1991
Marine Park	NEPA: MWLECC	NRCA Act, 1991
Environmental Protection Area	NEPA: MWLECC	NRCA Act, 1996
Forest Reserve	Forestry Department: MWLECC	Forest Act, 1996 and Forest Regulations
Special Fishery Conservation Area (SFCA)	Fisheries Division: Ministry of Agriculture and Fisheries	Fishing Industry Act, 1976
National Monument	Jamaica National Heritage Trust (JNHT) Ministry of Youth and Culture (MYC)	JNHT Act, 1985
Protected National Heritage	JNHT: MYC	JNHT Act, 1985
Game Sanctuary	NEPA (NRCA): MWLECC	Wild Life Protection Act, 1945
Game Reserve	NEPA (NRCA): MWLECC	Wild Life Protection Act, 1945

**Table 3-2 Existing categories of protected areas in Jamaica (as at 1 January 2012) - other designations not considered part of the system**

Source: (National Environment and Planning Agency, n.d.)

CATEGORY	RESPONSIBLE AGENCY	LAW
Tree Order Preservation	Local Authority (Town and Country Planning Authority): MWLECC and Local Government Department, through Parish Councils	Town and Country Planning Act, 1958
Conservation Area	NEPA (Town and Country Planning Authority, parish councils): MWLECC	Town and Country Planning Act, 1958
Protected Watershed	NEPA (NRCA): MWLECC	Watershed Act, 1963 Protection

**Table 3-3 Existing categories of protected areas in Jamaica (January 2012) - international designations**

Source: (National Environment and Planning Agency, n.d.)

CATEGORY	RESPONSIBLE AGENCY	CONVENTION
Ramsar Site	NEPA (NRCA): MWLECC	Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention)
World Heritage Site (no existing sites, however submissions have been made)	Jamaica National Heritage Trust: MYC	World Heritage Convention

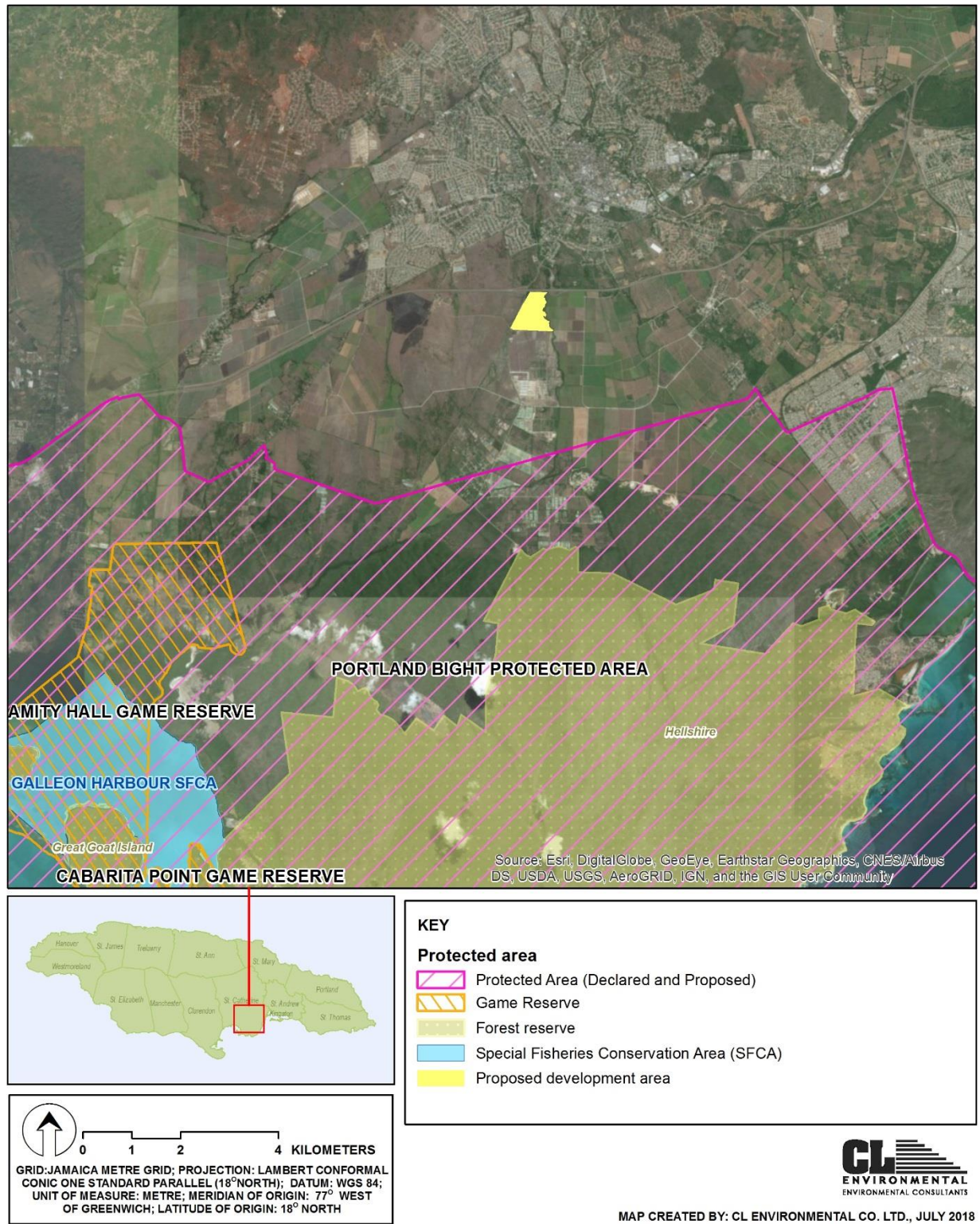


Figure 3-2 Protected areas within study area

As seen in Figure 3-2, the proposed study is not situated within an area protected by law. However, a number of areas protected under various legal instruments and agreements are found south of the project area:

- Portland Bight Protected Area
- Portland Bight Wetlands and Cays Ramsar Site
- Amity Hall Game Reserve
- Galleon Harbour SFCA
- Hellshire Forest Reserve
- Great Goat Island Forest Reserve

### 3.2.4 Reference International Guidelines/Standards

#### 3.2.4.1 Equator Principle Requirements

The Equator Principles (EPs) is a credit risk management framework for determining, assessing and managing environmental and social risk in Project Finance transactions. Project Finance is often used to fund the development and construction of major infrastructure and industrial projects. The EPs are adopted by financial institutions and are applied where total project capital costs exceed US\$10 million. The EPs are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making<sup>1</sup>. The EPs are based on the International Finance Corporation Performance Standards on Social and Environmental Sustainability and on the World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines).

##### 1.1.1.1 IFC Performance Standards on Social and Environmental Sustainability

Of the eight (8) Performance Standards, seven (7) are applicable:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
- Performance Standard 2: Labour and Working Conditions
- Performance Standard 3: Resource Efficiency and Pollution Prevention
- Performance Standard 4: Community Health, Safety, and Security
- Performance Standard 5: Land Acquisition and Involuntary Resettlement
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Performance Standard 8: Cultural Heritage

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<sup>1</sup> <http://www.equator-principles.com/index.php/about-ep>

### 1.1.1.2 World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines)

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors.

The Jamaican EIA process has been strongly influenced by the original World Bank Guidelines on EIAs. This EIA report has been reviewed for compliance with International Finance Performance (IFC) Standards 2012 and The World Bank Group General Environmental, Health and Safety Guidelines (2007) and meets all requirements for the Project from design to implementation.

The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are taken into account. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent.

Industry specific set of guidelines (in addition to the General Environmental, Health and Safety Guidelines) should be used as reference to this project:

- **Environmental, Health, and Safety Guidelines for Crude Oil and Petroleum Product Terminals (2007)**
- **Environmental, Health, and Safety Guidelines for Gas Distribution Systems (2007)**
- **Environmental, Health, and Safety Guidelines for Liquefied Natural Gas (LNG) Facilities (2017)**

### 1.1.1.3 National Fire Protection Association (NFPA) 59A

The NFPA 59A Standard was developed to provide minimum fire protection, safety, and related requirements for the location, design, construction, security, operation, and maintenance of LNG plants. It applies to the following:

1. Facilities that liquefy natural gas
2. Facilities that store, vapourize, transfer, and handle liquefied natural gas (LNG)
3. The training of all personnel involved with LNG
4. The design, location, construction, maintenance, and operation of all LNG facilities

It does not apply to the following:

1. Frozen ground containers
2. Portable storage containers stored or used in buildings

### 3. All LNG vehicular applications, including fuelling of LNG vehicles

The Standard provides general definitions to terms used in the industry and general requirements such as:

#### **General Requirements**

- Corrosion Control Overview
- Control Center
- Sources of Power
- Records

#### **Plant Siting and Layout**

- Plant Site Provisions
- Site Provisions for Spill and Leak Control
- Buildings and Structures
- Designer and Fabricator Competence
- Soil Protection for Cryogenic Equipment
- Concrete Design and Materials

#### **Process Equipment**

- Installation of Process Equipment
- Pumps and Compressors
- Flammable Refrigerant and Flammable Liquid Storage
- Process Equipment

#### **Stationary LNG Storage**

- General
- Design Considerations
- Tank Systems

#### **Vapourization Facilities**

- Classification of Vapourizers
- Design and Materials of Construction
- Vapourizer Piping, Intermediate Fluid Piping, and Storage Valves
- Relief Devices on Vapourizers
- Combustion Air Supply
- Products of Combustion

#### **Piping Systems and Components**

- Materials of Construction
- Installation
- Pipe Supports
- Piping Identification
- Inspection, Examination, and Testing of Piping
- Purging of Piping Systems
- Safety and Relief Valves
- Corrosion Control
- Cryogenic Pipe-in-Pipe Systems

#### **Instrumentation and Electrical Services**

- Liquid Level Gauging
- Pressure Gauging
- Vacuum Gauging
- Temperature Indicators
- Emergency Shutdown

- Electrical Equipment
- Electrical Grounding and Bonding

#### **Transfer Systems for LNG, Refrigerants, and Other Flammable Fluids**

- General Requirements
- Piping System
- Pump and Compressor Control
- Marine Shipping and Receiving
- Tank Vehicle and Tank Car Loading and Unloading Facilities
- Pipeline Shipping and Receiving
- Hoses and Arms
- Communications and Lighting

#### **Fire Protection, Safety, and Security**

- General
- Emergency Shutdown (ESD) Systems
- Fire and Leak Detection
- Fire Protection Water Systems
- Fire Extinguishing and Other Fire Control Equipment
- Maintenance of Fire Protection Equipment
- Personnel Safety
- Security

#### **Requirements for Stationary Applications Using ASME Containers**

- General Requirements
- Containers
- Container Filling
- Container Foundations and Supports
- Container Installation
- Automatic Product Retention Valves
- LNG Spill Containment
- Inspection
- Shop Testing of LNG Containers
- Shipment of LNG Containers
- Field Testing of LNG Containers
- Welding on Containers
- Piping
- Container Instrumentation
- Fire Protection and Safety
- Gas Detection
- Operations and Maintenance

#### **Operating, Maintenance, and Personnel Training**

- General Requirements
- Manual of Operating Procedures
- Emergency Procedures
- Monitoring Operations

- Transfer of LNG and Flammables
- Maintenance Manual
- Maintenance
- Personnel Training
- Records

**Performance (Risk Assessment) Based LNG Plant Siting**

- General Requirements
- Definitions
- Risk Calculations and Basis of Assessment

- LNG and Other Hazardous Materials Release Scenarios
- Release Probabilities and Conditional Probabilities
- Environmental Conditions and Occurrence Probabilities
- Hazard and Consequence Assessment
- Risk Result Presentation
- Risk Tolerability Criteria
- Risk Mitigation Approaches

Three important factors in siting of an LNG facility are defined in the Standard including the methodology in determining the factors. These are vapour dispersion, thermal flux or radian heat flux and container spacing.

## 4.0 ENVIRONMENTAL BASELINE

### 4.1 PHYSICAL

#### 4.1.1 Topography and Slopes

Elevation at the proposed project site is greatest in the north-western corner (~21.75m) and gradually slopes downward in a south-easterly direction to a low of ~17.75m (Figure 4-1).

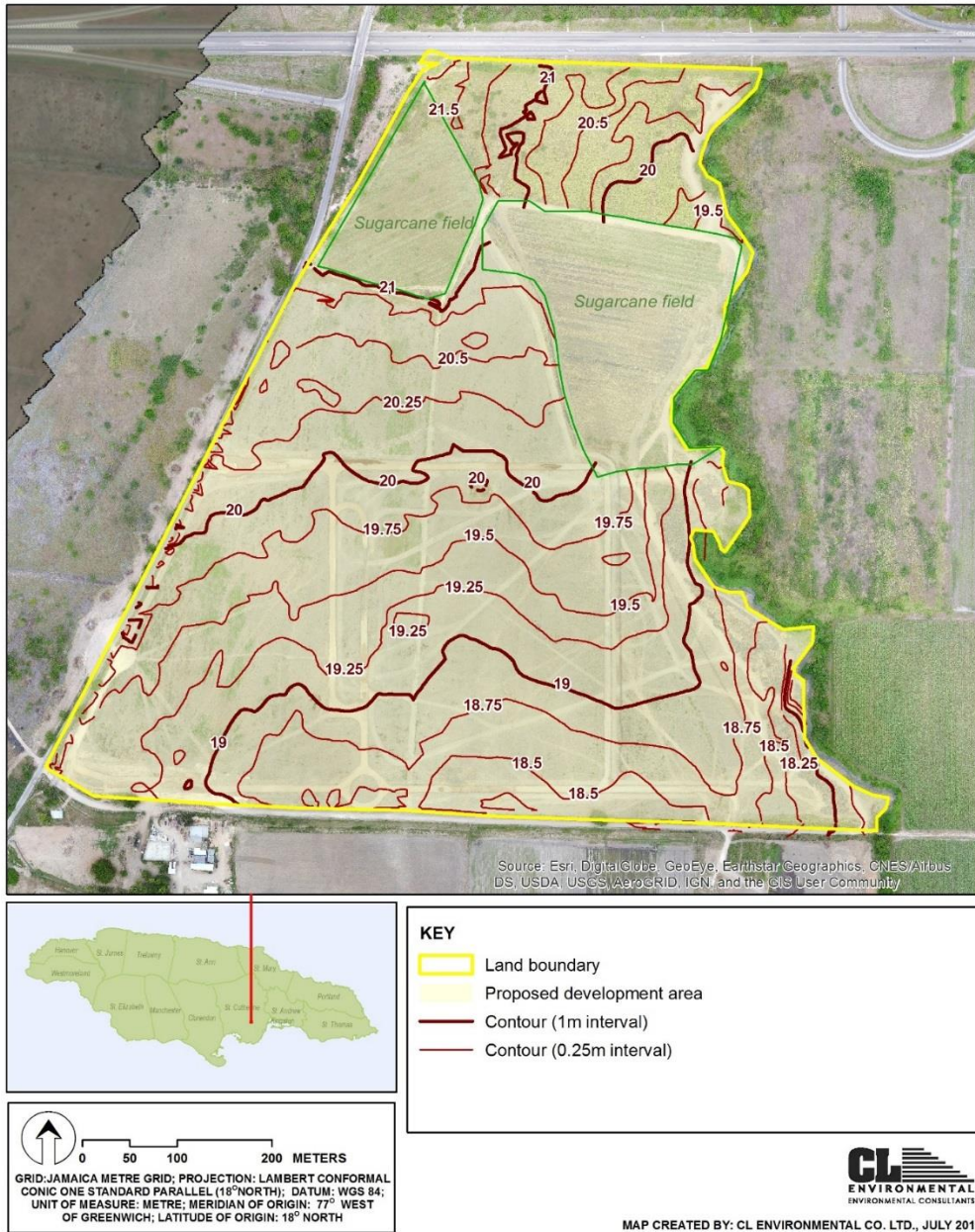


Figure 4-1 Topographic plan of proposed land, Hill Run, St. Catherine

### 4.1.2 Soils and Geology

Available data shows that the proposed area is located in an area with soil classified as Sydenham clay, with slight erosion (Figure 4-2). Geologically, the site is located over “Alluvium & Other Sup Deposit” (Figure 4-2).

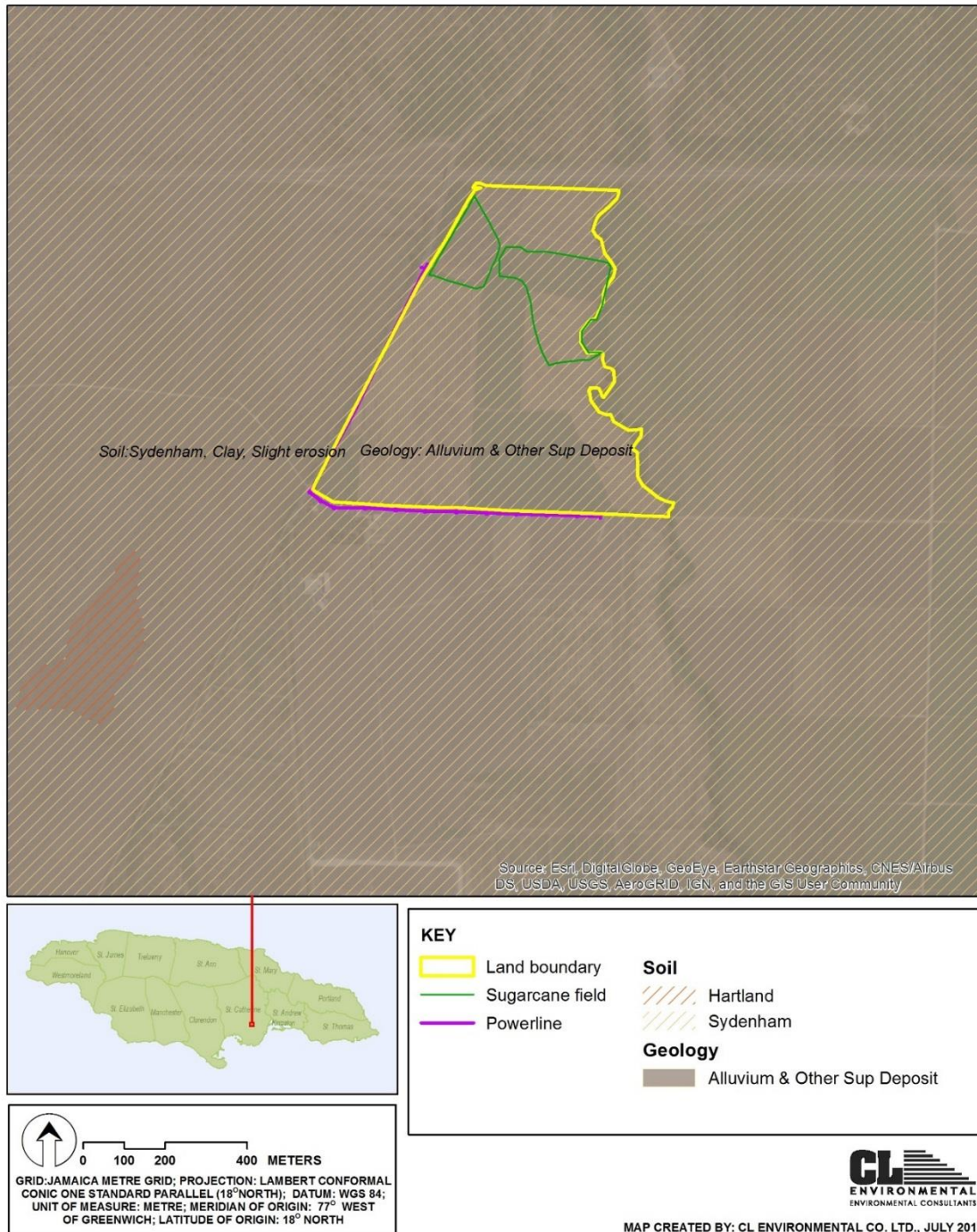


Figure 4-2 Soil and geology classification at proposed project site

### 4.1.3 Hydrology, Drainage and Ground Water Level

Bagasse Board 1 and 2 wells are located less than 1-kilometre northeast of the proposed site; these are the closest wells to the site (Figure 4-3). Also shown in Figure 4-3 are the natural and manmade drainage features in the project area, as well as the Rio Cobbe water management unit (WMU) within which the project falls.

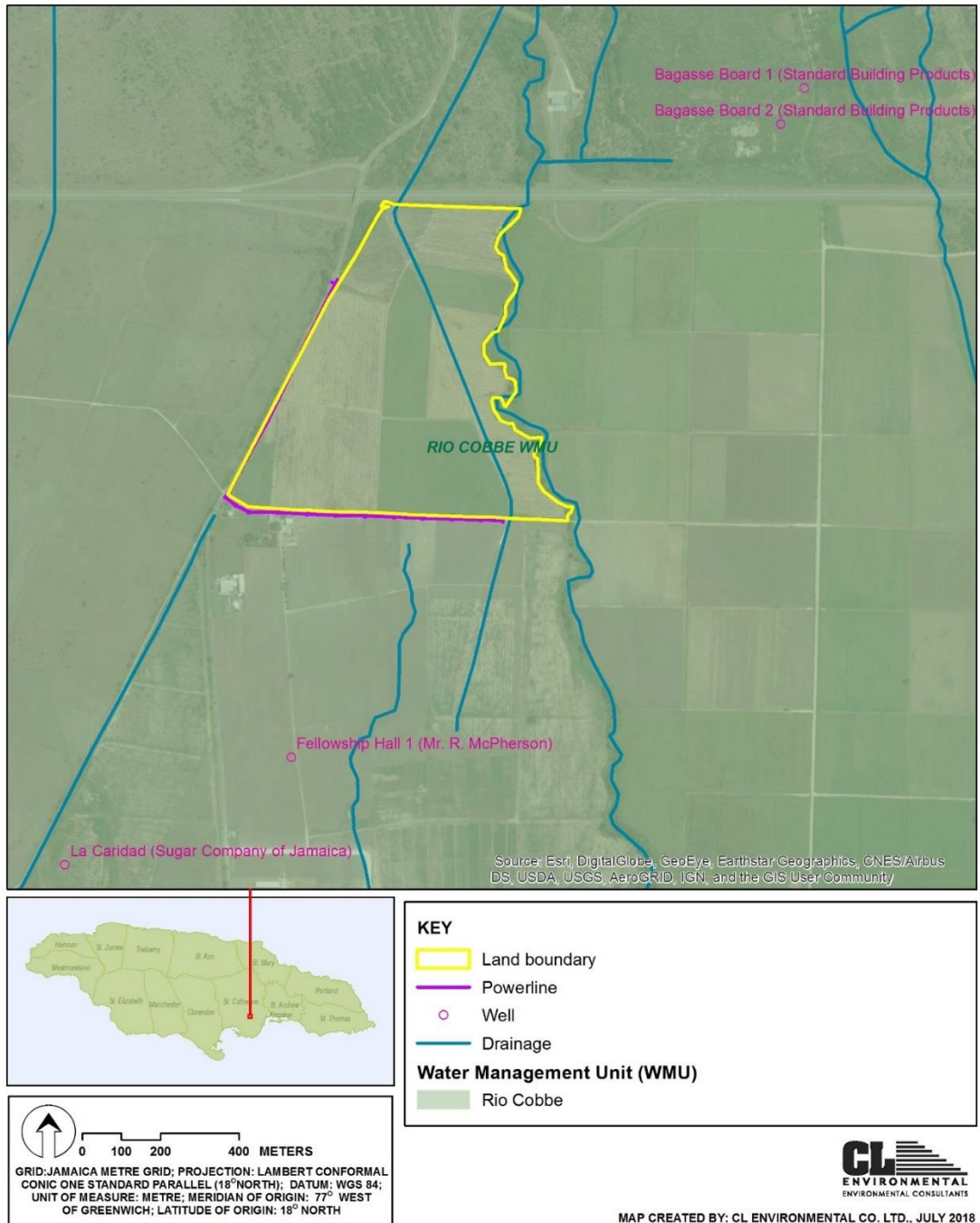


Figure 4-3 Water management units, drainage, and wells in vicinity of project site

#### 4.1.4 Water Quality

The following section was taken from the Environmental Impact Assessment for Caribbean Broilers Hill run Development” Hybrid Growth Centre “The Nest”, prepared by Environmental Solutions Limited, July 2018.

Water quality was tested at six (6) locations within the project area on January 23, 2018 (Table 4-1). Five (5) of these sampling locations were in the Town Gully, which borders the east of the site and one (1) location in the National Irrigation Commission canal located at the western boundary of the site.

Table 4-1 Water quality sampling locations

WQ Station	Station Location	GPS coordinates (Degrees, minutes, seconds)	Description
WQ1	Town Gully – Bridge 50 meters away from roundabout after leaving toll plaza	17°58’38” N, 76°57’52” W	The environment was sunny with partly cloudy skies and light north-westerly winds. The water appeared slightly cloudy flowing in a south western direction with a depth of approximately 2ft. The sample collected was slightly cloudy with suspended and settled solids.
WQ2	Town Gully -1000 meters away from highway	17°58’17” N, 76°57’54” W	The environment was sunny with partly cloudy skies and light north-westerly winds. The gully was overgrown; domestic garbage was seen on the banks and in the water. The water was approximately 2ft deep. The sample collected was slightly cloudy with suspended and settled solids.
WQ3	Town Gully- close to project site	17°58’4” N, 76°57’52” W	The environment was sunny with partly cloudy skies. The water in the gully was flowing gently stream. The sample was collected in water which was between 0.5 and 1ft deep. Debris and domestic garbage inclusive of engine oil bottle was present in the stream. There was also domestic garbage deposited along the sides of the stream.
WQ4	Town Gully – boundary of Imagination farms-start	17°57’57” N, 76°57’50” W	The environment was sunny with partly cloudy skies and light winds. Slow moving stream with silt at bottom; tires and floating debris were present in the water. The stream was between 0.5 and 2ft deep. The sample was slightly green with no distinct odour.
WQ5	Town Gully – boundary of Imagination farms -end	17°58’7” N, 76°57’45” W	The environment was sunny with partly cloudy skies and moderate south-westerly winds. Water was flowing slowly in a south west direction. There was sand at the bottom of the gully and small aquatic animals living within. The water was between 0.5 and 1.5ft deep. The sample collected was slightly green with no distinct odour.
WQ6	NIC Canal-close o project site.	17°58’11” N, 76°57’13” W	The environment was sunny with partly cloudy skies and light winds. The canal was located between the main road and the project site. Water approximately 1 ft deep was flowing within the canal at the time of the sampling exercise. Dead leaves, grass and uprooted aquatic plants were also present in the flowing water. Small aquatic plants were observed growing on the concreted floor of the canal

Parameters measured are shown in Table 4-2.

Table 4-2 Water quality parameters measured

• Biochemical Oxygen Demand (mg O <sub>2</sub> /L)	• pH (pH Units)
• Chemical Oxygen Demand (mg O <sub>2</sub> /L)	• Salinity (ppt)
• Nitrates (mg NO <sub>3</sub> <sup>-</sup> /L)	• Dissolved Oxygen (mg O <sub>2</sub> /L)
• Ammonia (mg NH <sub>3</sub> /L)	• Turbidity (NTU)
• Phosphate (mg PO <sub>4</sub> <sup>3-</sup> /L)	• Calcium (mg Ca/L)
• Total Nitrogen (mg N/L)	• Magnesium (mg Mg/L)
• Sulphate (mg SO <sub>4</sub> <sup>2-</sup> /L)	• Potassium (mg K/L)
• Chloride (mg Cl <sup>-</sup> /L)	• Sodium (mg Na/L)
• Salmonella (presence/Absence)	• Arsenic (mg As/L)
• Total Suspended Solids (mg/L)	• Chromium (mg Cr/L)
• Nitrate as Nitrogen (mg N/L)	• Copper (mg Cu/L)
• Total Coliform (MPN/100ml)	• Lead (mg Pb/L)
• Faecal Coliform (MPN/100ml)	• Mercury (mg Hg/L)
• <i>E. coli</i> (MPN/100ml)	• Iron (mg Fe/L)
• Fats Oils and Grease (mg/L)	• Zinc (mg Zn/L)
• Alkalinity (mg/L)	• Pesticide Screen (mg/L)

Water quality results are shown in Table 4-3.

The water quality data obtained from the present investigation indicates that both the Town Gully and NIC canal water quality are being affected by varied sources. The Town Gully is a major receptor for surface run-off from roads, industrial and commercial sites which could explain the elevated levels of phosphate, biochemical oxygen demand, sulphate, chloride, total dissolved solids, conductivity, potassium, and sodium at all sample points. It is suspected that the NIC canal is also influenced by industrial and/or commercial discharge.

The water quality in the NIC canal (WQ6) indicates evidence of possible trade effluent influences due to the further elevated pH, TDS, conductivity and metal levels. The discharge is most likely from industrial activities upstream from the investigated area. There are also clear anthropogenic effects as solid waste was observed all along the banks of the Town Gully.

Table 4-3 Water quality results of January 23, 2018.

Parameter (units)	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	NRCA Ambient (Fresh) Water Guideline
Nitrate (mg NO <sub>3</sub> <sup>-</sup> /L)	3.5	-	2.0	1.8	2.8	17.9	0.1 – 7.5
Salinity (ppt)	0.30	0.32	0.30	0.32	0.35	6.32	-
Temperature (°C)	30.5	28.0	28.0	27.5	28.6	29.5	-
Alkalinity (mg CaCO <sub>3</sub> /L)	228.4	235.4	244.5	244.8	185.9	118.6	-
Phosphate mg PO <sub>4</sub> <sup>3-</sup> /L)	1.63	2.18	2.12	2.23	1.61	<0.02	0.01 – 0.8
Nitrate as Nitrogen (mg NO <sub>3</sub> <sup>-</sup> -N/L)	0.8	<0.3	0.4	0.4	0.6	4.0	-
Ammonia (mg NH <sub>3</sub> /L)	1.14	2.39	1.95	1.67	<0.02	<0.02	-
Total Nitrogen (mg N/L)	3.1	2.8	2.3	2.8	2.0	25.6	-
Biochemical Oxygen Demand (mg O <sub>2</sub> /L)	2.3	2.8	2.5	2.8	2.0	1.6	0.8 – 1.7
Chemical Oxygen Demand (mg O <sub>2</sub> /L)	<3	<3	<3	3	<3	52	-
Turbidity (NTU)	5.08	11.0	8.00	7.02	6.14	3.96	-
Sulphate (mg SO <sub>4</sub> <sup>2-</sup> /L)	23	29	26	27	31	68	3.0 – 10.0
Chloride (mg Cl <sup>-</sup> /L)	21.4	48.8	34.4	38.4	132.2	3160.0	5.0 – 20.0
Salmonella (present/absent)	Present	Present	Absent	Present	Present	Present	-
Total Coliform (MPN/100ml)	>1600	>1600	>1600	>1600	>1600	>1600	-
E. coli (MPN/100ml)	>1600	>1600	79	350	350	920	-
Faecal Coliform (MPN/100ml)	>1600	>1600	240	540	350	>1600	-
Total Suspended Solids (mg/L)	5.6	11.4	6.8	6.1	4.2	9.0	-
pH (pH units)	8.00	7.71	7.71	7.88	8.09	8.91	7.00 – 8.40
Total Dissolved Solids (mg/L)	403.00	429.00	409.50	435.5	630.50	7254	120.0 – 300

Parameter (units)	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	NRCA Ambient (Fresh) Water Guideline
Conductivity (mS/cm)	0.69	0.70	0.67	0.70	1.04	12.1	0.15–0.6
Dissolved Oxygen (mg O <sub>2</sub> /L)	5.77	2.40	2.78	2.84	4.75	15.87	-
Fats, Oil and Grease (mg/L)	<1	<1	2	<1	<1	<1	-
Calcium (mg Ca/L)	83.9	80.6	80.6	81.5	84.5	74.8	40.0 - 101.0
Magnesium (mg Mg/L)	12.9	12.6	12.5	12.8	13.9	14.9	3.6 – 27.0
Potassium (mg K/L)	5.05	6.66	6.58	6.95	8.83	7.93	0.74 – 5.0
Sodium (mg Na/L)	35.2	41.0	39.8	40.4	90.4	2510	4.5 – 12.0
Arsenic (µg As/L)	<10	<10	<10	<10	<10	<10	-
Chromium (µg Cr/L)	<20	<20	<20	<20	<20	<20	-
Copper (µg Cu/L)	<10	<10	<10	<10	<10	<10	-
Lead (µg Pb/L)	<20	<20	<20	<20	<20	<20	-
Mercury (µg Hg/L)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-
Iron (µg Fe/ L)	163	185	171	67	22	22	-
Zinc (µg Zn/L)	15	11	14	19	21	29	-
Pesticide Screen (µg/L)	Not Detected	-	-	-	Not Detected	-	-

## 4.2 BIOLOGICAL

The proposed project area has been used for sugarcane farming and is regularly cleared and ploughed. As such the floral community is extremely limited and only primary, fast growing species were observed. A few shrubs, grasses and herbs were seen in the project area. A Mango and Guango Tree were seen nearby the proposed project area. The area can be classified as highly modified, with an extremely limited floral community, with extremely low species diversity and abundance.

The faunal community seen in the proposed project area is also a reflection of a highly modified habitat with extremely limited diversity and abundance. The surrounding agricultural lands (monoculture) also limit the surrounding faunal community. Monoculture reduces diversity of both the flora and faunal community, creating large areas of habitat which is only suitable to a few species, unlike naturally occurring forested areas. A few insects were seen in the project area; butterflies, dragonflies and several birds were observed in around the project area, including; cattle egrets, turkey vultures, nightingales and several doves.

The proposed project area also had a few irrigation canals (dry) and access roads. The lack of habitat and diversity, industrial and agricultural activities in and around the proposed project area, result in an extremely limited biological community. The proposed project may have a minimal and temporary impact on the biological community, temporarily displacing species. This is expected to be similar to the regular maintenance. Landscaping (planting a variety of shrubs trees and flowers) options may improve the floristic diversity available to insects and possibly birds over time.



Plate 4-1 Roadway along the property



Plate 4-2 Typical vegetation seen in sections of the property



Plate 4-3 Typical vegetation seen in sections of the property



Plate 4-4 Section of the project area with various grasses and shrubs



Plate 4-5 Small flowering shrubs with some butterflies and dragonflies



Plate 4-6 Cleared sugarcane area

### 4.3 SOCIO-ECONOMICS

#### 4.3.1 Demography

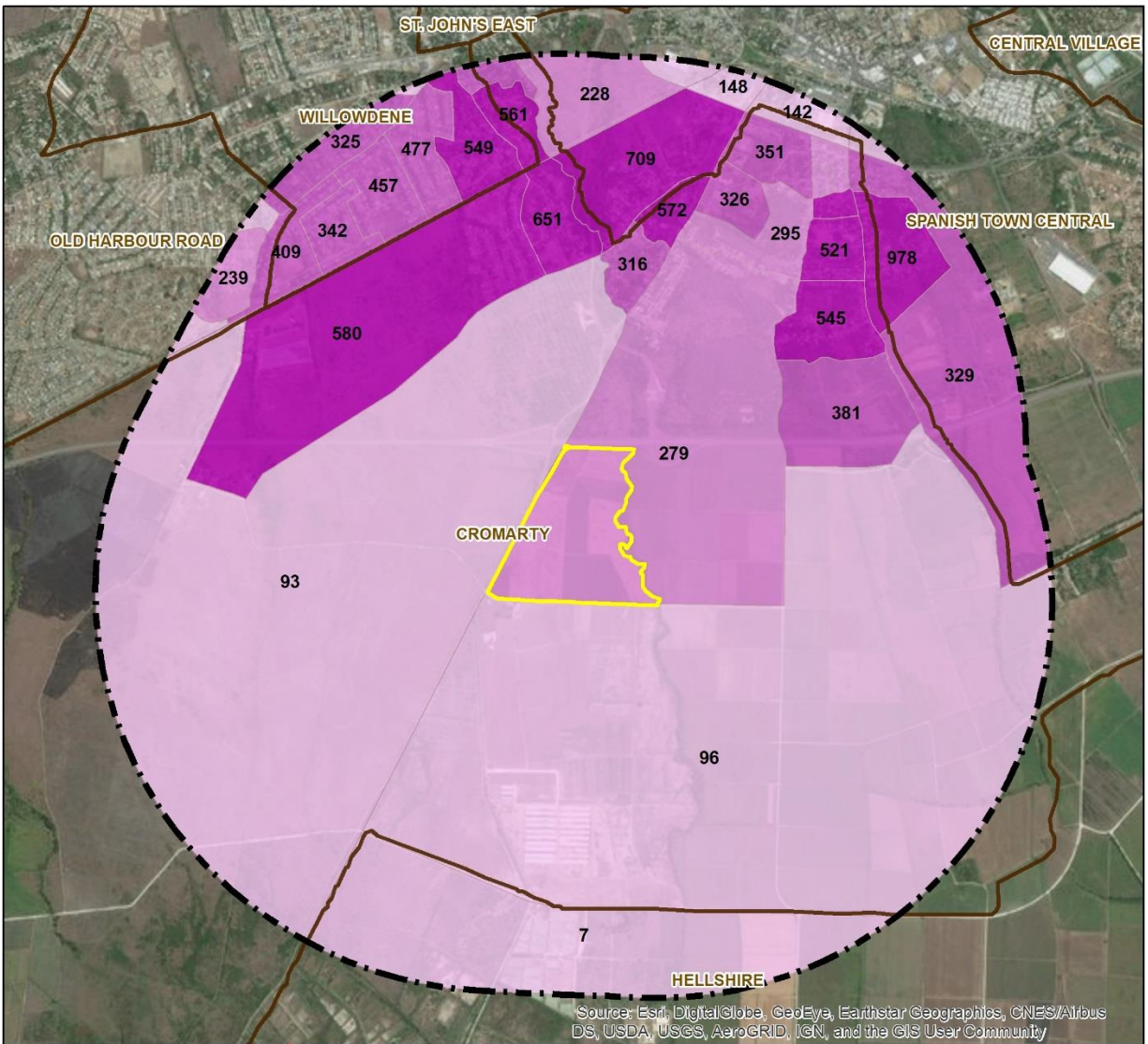
In order to assess the social elements of the proposed project, a Social Impact Area (SIA) is established. An SIA may be described as the estimated spatial extent of the proposed project’s effect on the surrounding communities. For the purposes of this project, the SIA encompasses a two (2) kilometre buffer around the proposed project land (Figure 4-4).

The total population within the SIA in 2011 was approximately 12,611 persons (STATIN 2011 Population Census). The land area within the SIA was calculated to be approximately 18.81 km<sup>2</sup>; therefore, the overall population density was calculated to be 670 persons/km<sup>2</sup>. This population density is higher than the national level (245 persons/km<sup>2</sup>) and the St. Catherine regional density of 434 persons/km<sup>2</sup> respectively (Table 4-4).

Table 4-4 Comparison of population densities for the year 2011

Source: STATIN Population Census 2011

Category	Jamaica	St. Catherine	SIA
Land Area (km <sup>2</sup> )	10,991.0	1,190.6	18.8
Population	2,697,983	516,218	12,611
Population Density	245	434	670



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



**KEY**

**Population (labelled)**

- 0 - 150
- 151 - 300
- 301 - 500
- 501 - 978

Community (dashed line)

Land boundary (yellow outline)

Social Impact Area (5 km) (dashed line)

0 250 500 1,000 METERS

GRID: JAMAICA METRE GRID; PROJECTION: LAMBERT CONFORMAL CONIC ONE STANDARD PARALLEL (18° NORTH); DATUM: WGS 84; UNIT OF MEASURE: METRE; MERIDIAN OF ORIGIN: 77° WEST OF GREENWICH; LATITUDE OF ORIGIN: 18° NORTH



MAP CREATED BY: CL ENVIRONMENTAL CO. LTD., JULY 2018

Source data: STATIN Population Census 2011  
 Figure 4-4 Population by ED within the SIA

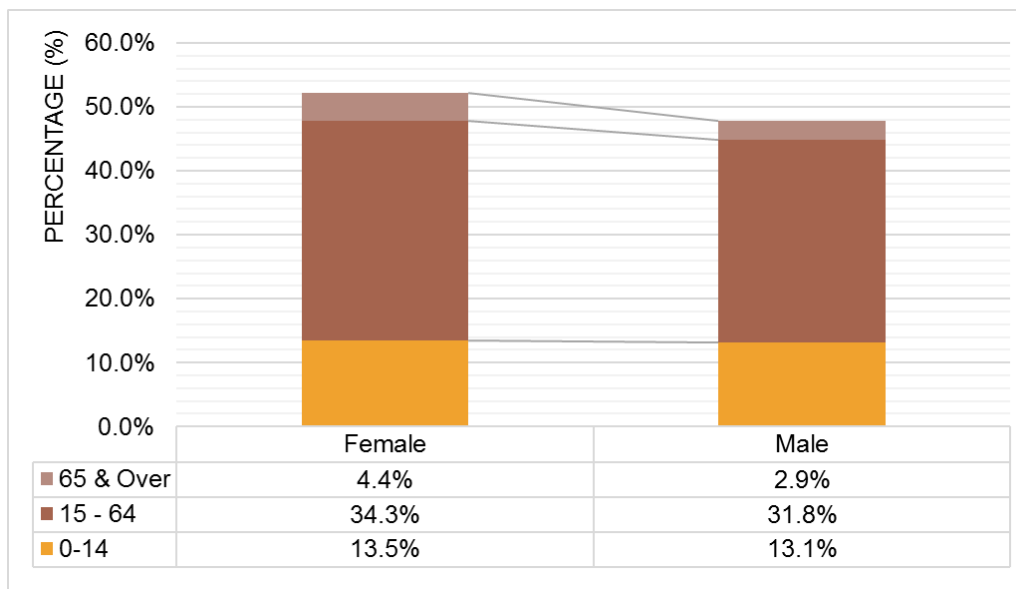
The segment of a population that is considered more vulnerable are the young (children less than five years old) and the elderly (65 years and over). In the SIA population, 8.0% comprised the vulnerable young category, and a comparable 7.3% comprised the elderly. Within the SIA, the 15-64 years' age category accounted for 66.1% and can therefore be considered a working age population, similar to that for the nation (65.9%) and the parish of St. Catherine (66.9%) (Table 4-5).

**Table 4-5 Age categories as percentage of the population for the year 2011**

Source: STATIN Population Census 2011

Age Categories	Jamaica	St. Catherine	SIA
0-14	26.1%	26.1%	26.6%
15 - 64	65.9%	66.9%	66.1%
65 & Over	8.1%	7.0%	7.3%

As seen in Figure 4-5, Census 2011 data indicated that there were more females within all three age cohorts considered when compared to males. Sex ratio for all age cohorts within the SIA was calculated to be 91.6 males per one hundred females.



Source data: STATIN Population Census 2011

**Figure 4-5 Male and female percentage population by age category in 2011 for the SIA**

### 4.3.2 Housing

There were 3,629 housing units (building or buildings used for living purposes at the time of the census), 4,229 dwellings (any building or separate and independent part of a building in which a person or group of persons lived at the time of the census) and 4,396 households within the SIA in 2011. The average household size in the SIA was 2.9 persons/ household; however, this varied spatially by ED with a minimum size of 1.7 person/ household to a maximum of 8.9 persons/ household (Figure 4-6).

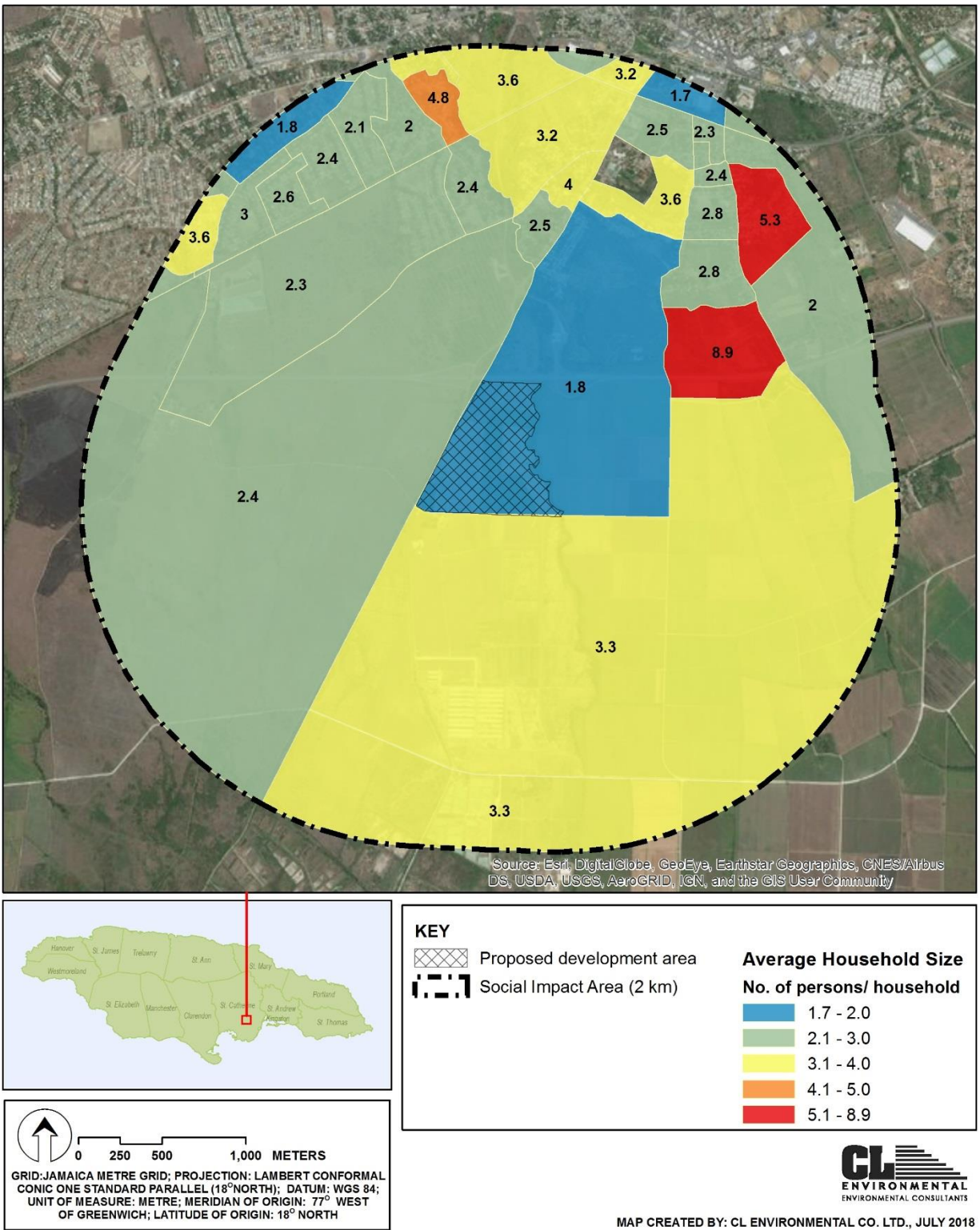
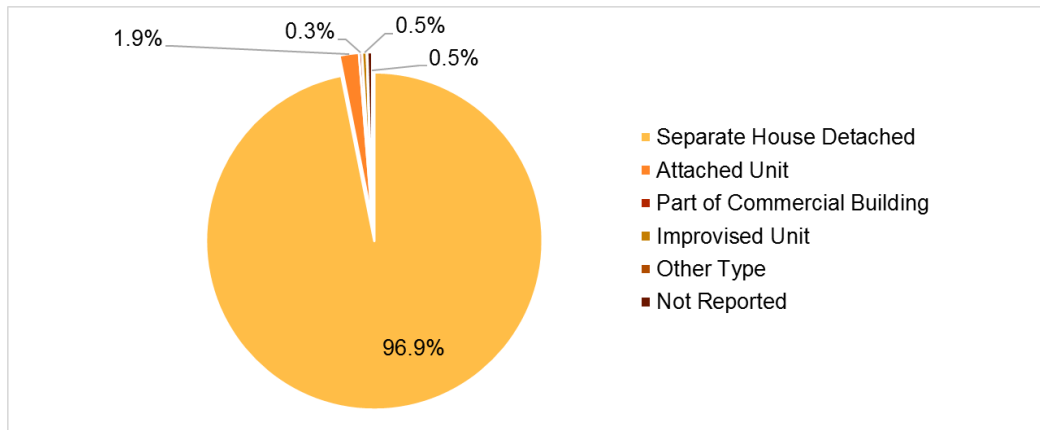


Figure 4-6 Household size by ED for 2011 within the SIA for Segment 1, Section 1A of the SCHIP

Approximately 96.9% of the housing units in the SIA were of the separate detached type, the remaining 3.1% were attached, improvised unit, part of a commercial building or not reported (Figure 4-7).



Source: STATIN Population Census 2011

Figure 4-7 Percentage of housing units by type within the SIA for Segment 1, Section 1A of the SCHIP

### 4.3.3 Water Supply

The National Water Commission (NWC) is the public agency responsible for providing Jamaica’s domestic water supply. The majority of the households within the SIA (91.9%) received their domestic water supply from a public source (Table 4-6). Water demand for the SIA in 2011 was estimated to be 2,864,210 litres/day (~756,644 gals/day).

Table 4-6 Percentage of households by water supply for the year 2011

Source: STATIN Population Census 2011

	Category	Jamaica	St. Catherine	SIA
Public Source	Piped in Dwelling	49.7%	63.5%	56.8%
	Piped in Yard	16.5%	16.1%	33.7%
	Stand Pipe	7.1%	1.8%	1.2%
	Catchment	2.2%	0.9%	0.3%
Private Source	Into Dwelling	6.4%	4.4%	2.5%
	Catchment	9.8%	3.6%	3.7%
	Spring/ River	3.0%	3.1%	0.0%
	Trucked Water/Water Truck	2.1%	3.7%	0.2%
	Other	1.8%	1.6%	0.7%
	Not Reported	1.3%	1.2%	1.0%

### 4.3.4 Sewage

It is estimated that approximately 1,047,099 litres/day (~276,614 gals/day) of wastewater was generated within the study area in 2011.

### 4.3.5 Solid Waste Generation and Disposal

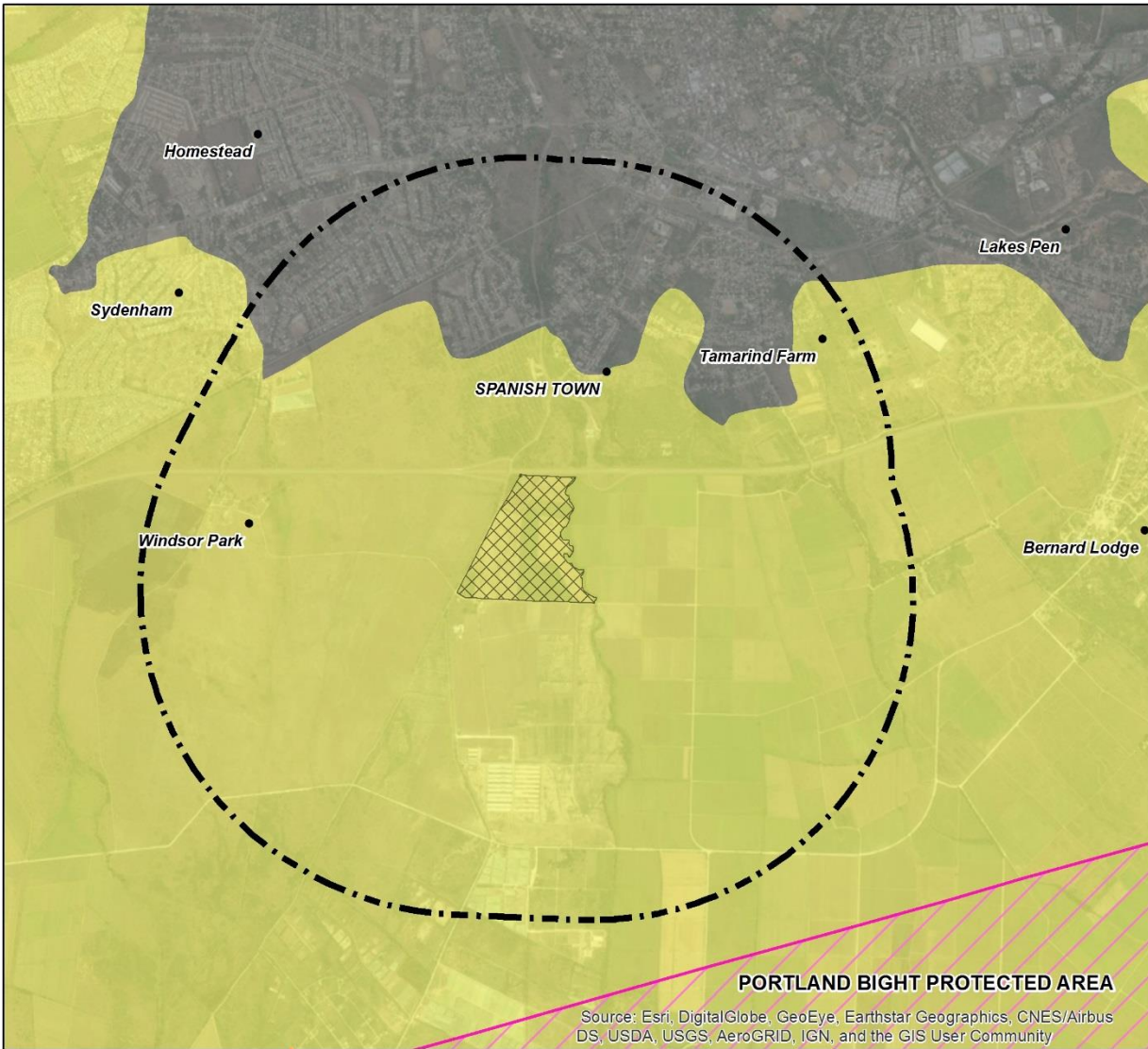
It is estimated that in 2011, approximately 18,069 kg (~18 tonnes) of solid waste was being generated. The National Solid Waste Management Authority (NSWMA) is responsible for domestic solid waste collection within the study area. In residential areas, garbage is collected once per week. This service is provided free (partial covered by property taxes) for the households within the area.

### 4.3.6 Land Use

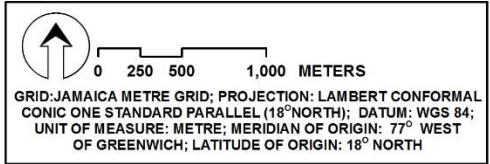
As seen in Figure 4-8, land use within the SIA is generally agricultural (fields and plantation), with buildings and other infrastructure towards the northern sections in Spanish Town. Currently at the project site, two sugarcane fields exist, and the remainder of land is vacant since being cleared for development being undertaken by Caribbean Broilers (CB) (Figure 4-9). CB will be relocating its poultry processing facilities to the location, "The Nest", and will include chicken processing, a livestock research centre, farms, and other activities.

Numerous roadways and pathways exist on the project land and Highway 2000 runs parallel to the northern land parcel boundary. Manmade drainage features exist, and a natural watercourse more or less follows the eastern land boundary (Figure 4-9).

As mentioned previously, the Portland Bight Protected Area is situated south of the project site; at its closest, it is 2.3 km south of the land parcel (Figure 4-8).



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



**KEY**

- Settlement
- ▨ Proposed development area
- ⊖ Social Impact Area (2 km)

**Land use (1998)**

- Buildings and other infrastructure
- Fields and plantations

**Protected area**

- ▨ Protected Area (Declared and Proposed)



MAP CREATED BY: CL ENVIRONMENTAL CO. LTD., JULY 2018

Figure 4-8 Land use within the SIA

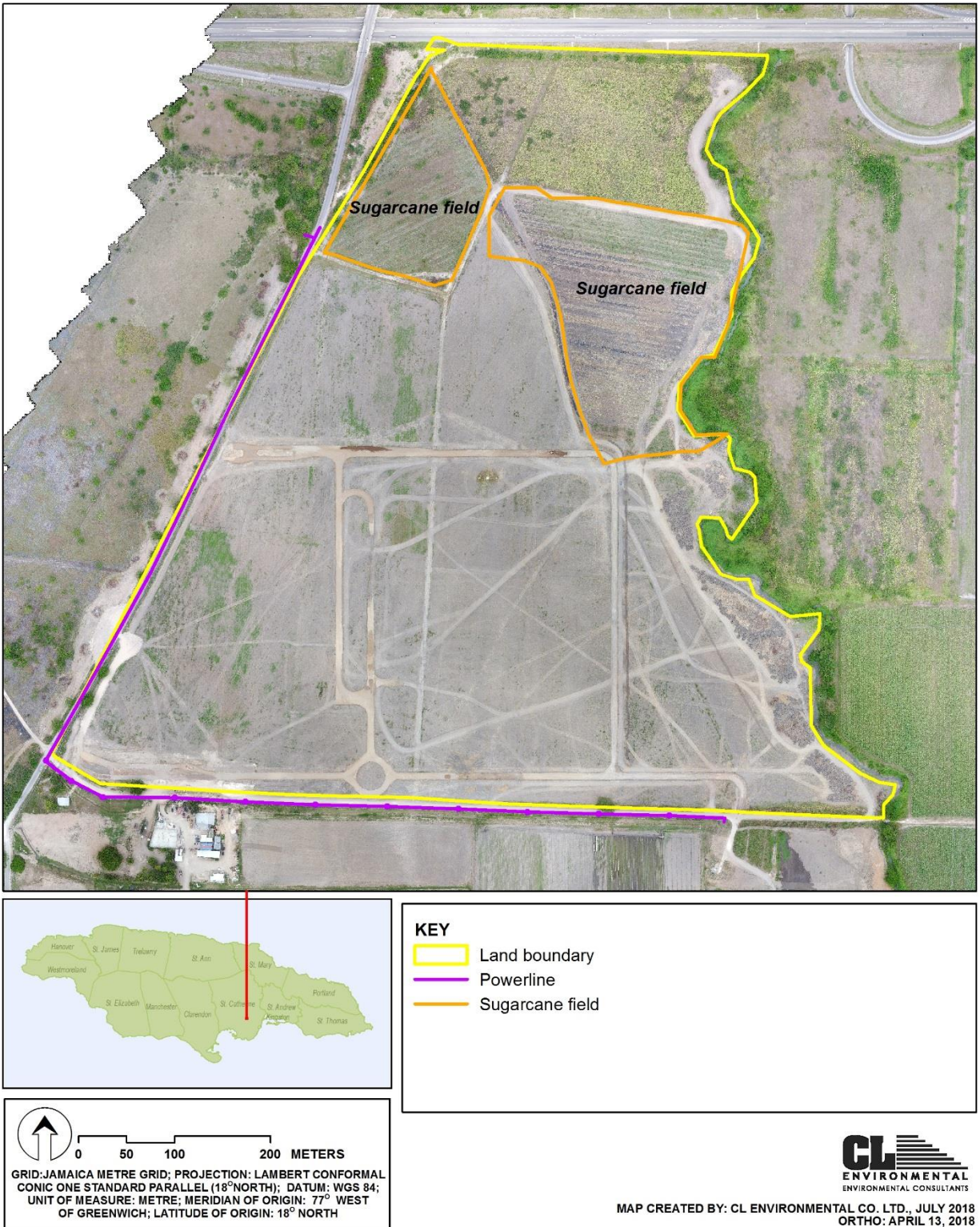


Figure 4-9 Land use at the project site

## 5.0 POTENTIAL IMPACTS

### 5.1 CONSTRUCTION IMPACTS

#### 5.1.1 Air Quality

Site preparation and construction has the potential to have a two-folded direct negative impact on air quality of the surrounding area. The first impact is air pollution generated from the construction equipment and transportation. The second is from fugitive dust from the proposed construction areas and raw materials stored on site. Fugitive dust has the potential to affect the health of construction workers and the resident population.

#### 5.1.2 Noise

Site clearance for the proposed development necessitates the use of heavy equipment to carry out the job. Equipment to be used include bulldozers, backhoes etc. They possess the potential to have a direct negative impact on the noise climate. Construction noise can result in short-term impacts of varying duration and magnitude. The construction noise levels are a function of the scale of the project, the phase of the construction, the condition of the equipment and its operating cycles and the number of pieces of construction equipment operating concurrently.

#### 5.1.3 Vibration

Construction activities often generate vibration complaints. This may be as a result of interfering with persons normal routines/activities. This can become more acute if the community has no understanding of the extent and duration of the construction. This can lead to misunderstandings if the contractor is considered to be insensitive by the communities although he may believe he is in compliance with the required conditions/ordinances. Construction activities may result in various degrees of ground vibration, dependent on the type of equipment used and the methodologies employed.

#### 5.1.4 Water Quality

Elevation at the proposed project site is greatest in the north-western corner and gradually slopes downward in a south-easterly direction. Based on the site topography, there may be the potential for coarse and fine material stored on site to drain into the gully located at the eastern boundary of the project site, resulting in excessive siltation.

#### 5.1.5 Biological Community

The proposed project may have a minimal and temporary negative impact on the biological community, temporarily displacing some faunal species. This is expected to be similar to the regular clearance and maintenance of the project area. Landscaping (planting a variety of shrubs trees and flowers) options may improve the floristic diversity available to insects and possibly birds over time.

There will be no major impact on vegetation as the area can be classified as highly modified, with an extremely limited floral community, with extremely low species diversity and abundance. No rare, endemic plant species were observed on site.

### 5.1.6 Employment

There is the potential for increased employment during the pre-clearance and construction phases. In addition it is anticipated that indirect and induced jobs are expected to be created during the site clearance and construction phases respectively; thus further benefitting the community. This represents a significant level of employment within the study area and has the potential to be a significant positive impact.

## 5.2 OPERATIONAL IMPACTS

### 5.2.1 Electricity and Energy Generation

The installation of a 10MW Natural Gas Fired Distributed Generation facility at Hill Run, St. Catherine will be beneficial for both CB and JPS. Benefits include:

1. Significantly improving the power reliability by providing a reliable source of electricity via two highly reliable prime power generating units operating in parallel with the grid.
2. Providing an uninterrupted power supply to the CB at the required voltage of 440 V
3. The existing transformers supplying the CB will be replaced with 24KV/440V upgrades, which will ensure that grid power is supplied at the required factory voltage and lessen the impact of voltage fluctuation on the grid.
4. The new generation will be able to accommodate future growth at the factory.
5. The project being undertaken fulfils the goal of modernizing the energy sector as well as making it more efficient through the primary use of LNG. It is also in keeping with Jamaica's National Energy Policy which seeks to develop a modern, efficient, diversified and environmentally sustainable energy sector.

### 5.2.2 Air Quality

An air dispersion modelling exercise involving the AERMOD air dispersion model was conducted to predict the impact of the air emissions on ambient air quality from the proposed power generation facility to be located at a poultry processing plant in Hill Run, St. Catherine, Jamaica.

Table 5-1 outlines the manufacturer's emission rates for particulate matter with diameter less than ten microns (PM10), sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), and formaldehyde from the proposed CG170-20 generator, as well as certain priority air pollutant emission rates that were derived from USEPA emission factors. Boiler emission rates were calculated based on USEPA emission factors and proposed steam production data and these are listed in Table 5-2 along

with the boiler stack parameters. The normal operating scenario that was considered for this modelling project involved the heat recovery steam generators (HRSGs) and boiler #2 operating, with boiler #1 as backup during maintenance of boiler #2. Boiler #1 and #2 have similar emission specifications.

Table 5-1 Source Information Data for CG170-20 Generator

Source ID	DG1_3 Main	DG1	DG2	DG3	DG4	DG4 HRSG	DG5	DG5 HRSG
Type	POINT	POINT	POINT	POINT	POINT	POINT	POINT	POINT
UTM X Coord, m	291691	291682	291691	291700	291709	291709	291718	291718
UTM Y Coord, m	1987686	1987690	1987690	1987690	1987687	1987690	1987687	1987690
Elevation, m	19.59	19.91	19.99	19.89	19.55	19.79	19.48	19.69
Height, m	9.144	9.144	9.144	9.144	9.144	9.144	9.144	9.144
Exit Temp, K	523.15	686.15	686.15	686.15	523.15	686.15	523.15	686.15
Exit Velocity, m/s	17.3	30.3	30.3	30.3	23.1	30.3	23.1	30.3
Inside Diameter, m	1.016	0.508	0.508	0.508	0.508	0.508	0.508	0.508
PM <sub>10</sub> , g/s	3.81	1.27	1.27	1.27	1.27	1.27	1.27	1.27
SO <sub>2</sub> , g/s	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01
NO <sub>x</sub> , g/s	2.16	0.72	0.72	0.72	0.72	0.72	0.72	0.72
CO, g/s	4.35	1.45	1.45	1.45	1.45	1.45	1.45	1.45
Formaldehyde, g/s	0.633	0.211	0.211	0.211	0.211	0.211	0.211	0.211
1,1,2,2-Tetrachloroethane, g/s	1.03E-04	3.44E-05	3.44E-05	3.44E-05	3.44E-05	3.44E-05	3.44E-05	3.44E-05
1,2-Dichloroethane, g/s	6.07E-05	2.02E-05	2.02E-05	2.02E-05	2.02E-05	2.02E-05	2.02E-05	2.02E-05
1,3-Butadiene, g/s	6.89E-04	2.30E-04	2.30E-04	2.30E-04	2.30E-04	2.30E-04	2.30E-04	2.30E-04
Acetaldehyde, g/s	2.16E-02	7.19E-03	7.19E-03	7.19E-03	7.19E-03	7.19E-03	7.19E-03	7.19E-03
Acrolein, g/s	1.33E-02	4.42E-03	4.42E-03	4.42E-03	4.42E-03	4.42E-03	4.42E-03	4.42E-03
Benzene, g/s	1.14E-03	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04
Carbon Tetrachloride, g/s	9.47E-05	3.16E-05	3.16E-05	3.16E-05	3.16E-05	3.16E-05	3.16E-05	3.16E-05
Chloroform, g/s	7.36E-05	2.45E-05	2.45E-05	2.45E-05	2.45E-05	2.45E-05	2.45E-05	2.45E-05
Ethylene Dibromide, g/s	1.14E-04	3.81E-05	3.81E-05	3.81E-05	3.81E-05	3.81E-05	3.81E-05	3.81E-05
Methylene Chloride, g/s	5.16E-05	1.72E-05	1.72E-05	1.72E-05	1.72E-05	1.72E-05	1.72E-05	1.72E-05
Phenol, g/s	6.20E-05	2.07E-05	2.07E-05	2.07E-05	2.07E-05	2.07E-05	2.07E-05	2.07E-05
Styrene, g/s	6.09E-05	2.03E-05	2.03E-05	2.03E-05	2.03E-05	2.03E-05	2.03E-05	2.03E-05
Vinyl Chloride, g/s	3.85E-05	1.28E-05	1.28E-05	1.28E-05	1.28E-05	1.28E-05	1.28E-05	1.28E-05
Xylene, g/s	4.75E-04	1.58E-04	1.58E-04	1.58E-04	1.58E-04	1.58E-04	1.58E-04	1.58E-04

Table 5-2 Source Information Data for Boilers

Source ID	B1	B2
Type	POINT	POINT
UTM X Coord, m	291648	291654
UTM Y Coord, m	1987711	1987711
Elevation, m	21.02	21.03
Height, m	9.144	9.144
Exit Temp, K	463.15	463.15
Exit Velocity, m/s	2.7	2.7
Inside Diameter, m	0.61	0.406
PM <sub>10</sub> , g/s	0.1954	0.1954
SO <sub>2</sub> , g/s	0.1641	0.1641
NO <sub>x</sub> , g/s	0.01485	0.01485
CO, g/s	0.00117	0.00117
Benzene, g/s	4.103E-06	4.103E-06
Benzo (a) pyrene, g/s	2.345E-09	2.345E-09
Formaldehyde, g/s	0.000146	0.000146
Arsenic, g/s	3.908E-07	3.908E-07
Beryllium, g/s	2.345E-08	2.345E-08
Cadmium, g/s	2.149E-06	2.149E-06
Chromium, g/s	2.735E-06	2.735E-06
Cobalt, g/s	1.641E-07	1.641E-07
Manganese, g/s	7.425E-07	7.425E-07
Mercury, g/s	5.080E-07	5.080E-07
Nickel, g/s	4.103E-06	4.103E-06
Selenium, g/s	4.689E-08	4.689E-08
Zinc, g/s	5.666E-05	5.666E-05

Table 5-3 and Table 5-4 show the results of the model runs for the proposed LNG-fired power generation facility and their comparisons with the Significant Impact Concentrations (SICs) and the ambient air quality standards for both criteria and priority air pollutants, respectively. The SICs are the incremental concentrations that should not be exceeded by any proposed (new) facility. The other model targets are the predicted maximum concentrations plus the background concentrations that will compare with the National Ambient Air Quality Standard (NAAQS) and/or Guideline concentration.

Table 5-3 Summary of maximum predicted concentrations for criteria pollutants

Pollutant	Avg. Period	Background (µg/m <sup>3</sup> )	Significant Impact Concentration (µg/m <sup>3</sup> )	Jamaican NAAQS (µg/m <sup>3</sup> )	Proposed Sources – Normal Mode		
					Max Conc (µg/m <sup>3</sup> )	UTME (m)	UTMN (m)
PM <sub>10</sub>	24-hr	14	80	150	86.2	291639	1987439
	Annual	20	21	60	12.9	291292	1987793
NO <sub>2</sub>	1-hr	0	N/A	400	45.6	288692	1993693
	24-hr	0	80	N/A	27.5	291639	1987439
	Annual	0	21	100	6.4	291292	1987793
SO <sub>2</sub>	1-hr	0	N/A	700	1.1	291639	1987439
	24-hr	0	80	280	0.7	291639	1987439
	Annual	0	21	60	0.1	291292	1987793
CO	1-hr	0	2000	40000	158.4	291639	1987439
	8-hr	0	500	10000	141.5	291639	1987439

Table 5-4 Summary of maximum predicted concentrations for priority air pollutants

Pollutant	Avg. Period	Background (µg/m <sup>3</sup> )	SIC (µg/m <sup>3</sup> )	Guideline Conc. (µg/m <sup>3</sup> )	Proposed Sources – Normal Mode		
					Max Conc (µg/m <sup>3</sup> )	UTME (m)	UTMN (m)
1,1,2,2 Tetrachloroethane	1-hr	0	0	0.2	0.0037	291639	1987439
1,2-Dichloroethane	1-hr	0	0	0.4	0.00218	291639	1987439
1,3-Butadiene	1-hr	0	0	0.04	0.02	291639	1987439
Acetaldehyde	1-hr	0	0	1250	0.8	291639	1987439
	24-hr	0	0	500	0.5	291639	1987439
Acrolein	1-hr	0	0	58.75	0.5	291639	1987439
	24-hr	0	0	23.5	0.3	291639	1987439
Arsenic	1-hr	0	0	0.75	7E-05	291292	1987793
	24-hr	0	0	0.3	2E-05	N/A	N/A
Benzene	Annual	0	0	1	0.00384	291292	1987793
Benzo (a) pyrene	1-hr	0	0	0.00275	0	N/A	N/A
	24-hr	0	0	0.0011	0	N/A	N/A
Beryllium	Annual	0	0	0.0013	0	N/A	N/A
Cadmium	1-hr	0	0	5	3.9E-04	291292	1987793
	24-hr	0	0	2	1.2E-04	291292	1987793
Carbon Tetrachloride	1-hr	0	0	6	0.0034	291639	1987439
	24-hr	0	0	2.4	0.0021	291639	1987439
Chloroform	1-hr	0	0	1250	0.00264	291639	1987439
	24-hr	0	0	500	0.00166	291639	1987439
Chromium	1-hr	0	0	3.75	0.0005	291292	1987793
	24-hr	0	0	1.5	0.00016	291292	1987793
Cobalt	24-hr	0	0	0.12	1E-05	N/A	N/A
Ethylene Dibromide	1-hr	0	0	7.5	0.0041	291639	1987439
	24-hr	0	0	3	0.0026	291639	1987439
Formaldehyde	1-hr	0	0	162.5	22.7	291639	1987439
	24-hr	0	0	65	14.3	291639	1987439
Manganese	Annual	0	0	119	1E-05	N/A	N/A
Mercury	1-hr	0	0	5	9E-05	291292	1987793
	24-hr	0	0	2	3E-05	291292	1987793
Methylene Chloride	1-hr	0	0	550	0.00185	291639	1987439
	24-hr	0	0	220	0.00117	291639	1987439
Nickel	1-hr	0	0	5	7.5E-04	291292	1987793
	24-hr	0	0	2	2.3E-04	291292	1987793
Phenol	1-hr	0	0	250	0.00223	291639	1987439
	24-hr	0	0	100	0.0014	291639	1987439
Selenium	1-hr	0	0	25	1E-05	N/A	N/A
	24-hr	0	0	10	0	N/A	N/A
Styrene	1-hr	0	0	2500	0.00219	291639	1987439
	24-hr	0	0	1000	0.00138	291639	1987439
Vinyl Chloride	24-hr	0	0	1	8.7E-04	291639	1987439
	Annual	0	0	0.2	1.3E-04	N/A	N/A
Xylenes	1-hr	0	0	5750	0.017	291639	1987439
	24-hr	0	0	2300	0.0107	291639	1987439
Zinc	24-hr	0	0	12	0.0032	291292	1987793

It was determined that the predicted maximum concentrations from the operation of the proposed LNG fired power generation facility achieved compliance with all Ambient Air Quality Standards, Guideline Concentrations and Significant Impact Concentrations, except for 24hr PM10 SIC. Table 5-5 identifies the ten highest 24hr PM10 predicted concentrations at grid and plant boundary receptors, and it revealed the one exceedance above the SIC occurring at the plant boundary.

Table 5-5 Ten highest predicted 24 hour PM10 Concentrations

Receptor Type	X Coordinate, m	Y Coordinate, m	Predicted 24h PM <sub>10</sub> Concentration, µg/m <sup>3</sup>
Plant Boundary	291639	1987439	86.2
Grid	291592	1987393	69.5
Grid	291292	1987793	60.8
Grid	291692	1987393	60.6
Grid	291292	1987893	56.7
Grid	291492	1987393	55.7
Grid	291192	1987693	55.7
Grid	291192	1987793	53.9
Grid	291392	1987493	53.3
Grid	291192	1987893	50.7

There are no emission standards for a gas-fired stationary internal combustion engine, and hence no comparison was made with the proposed emission rates from each 2 MW generating set. Additionally, for the gas-fired boilers achieved compliance with CO and PM emission standards.

Since there is no exceedance above the Ambient Air Quality Standards, Guideline Concentrations and Significant Impact Concentrations beyond the facility fence line, the operations of the proposed facility will not create any negative impact on ambient air quality within the study area considered.

### 5.2.3 Noise

Noise modelling using SoundPlan 8.0 was used to determine the potential noise impact from the operation of the proposed facility. The General Prediction model was used and within it, atmospheric conditions were set: temperature 30 °C, relative humidity 80% and air pressure of 1013.3 mbar.

Noise receivers were set up in the model to indicate the noise levels from the operation of the power plant. The results indicated that the noise levels would be compliant with the NRCA industrial noise standard of 70 dBA at the boundary. The results are indicated in Table 5-6 and depicted in Figure 5-1.

Table 5-6 Results of the predicted noise levels from the power plant operation

STATION	PREDICTED NOISE LEVEL (dBA)	NRCA STANDARD (dBA)
B1	61.1	70
B2	61.3	70
B3	63.2	70
B4	66.9	70
OFFICE	37.7	70
POLICE STN	25.7	70
STN1	32.3	70
STN2	37.2	70
STN3	47.3	70
STN4	42.8	70
STN5	41.3	70

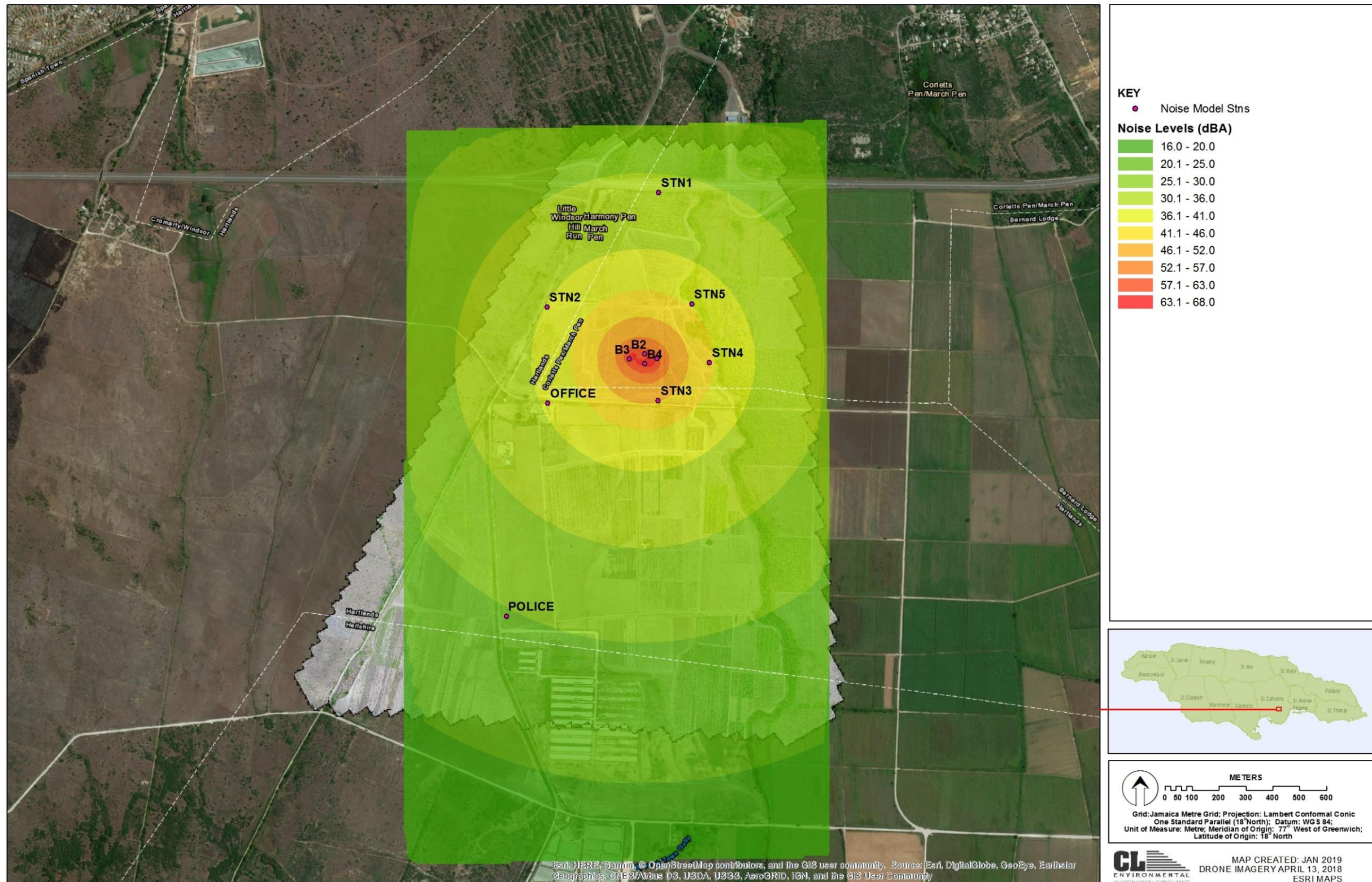


Figure 5-1 Results of the predicted noise levels