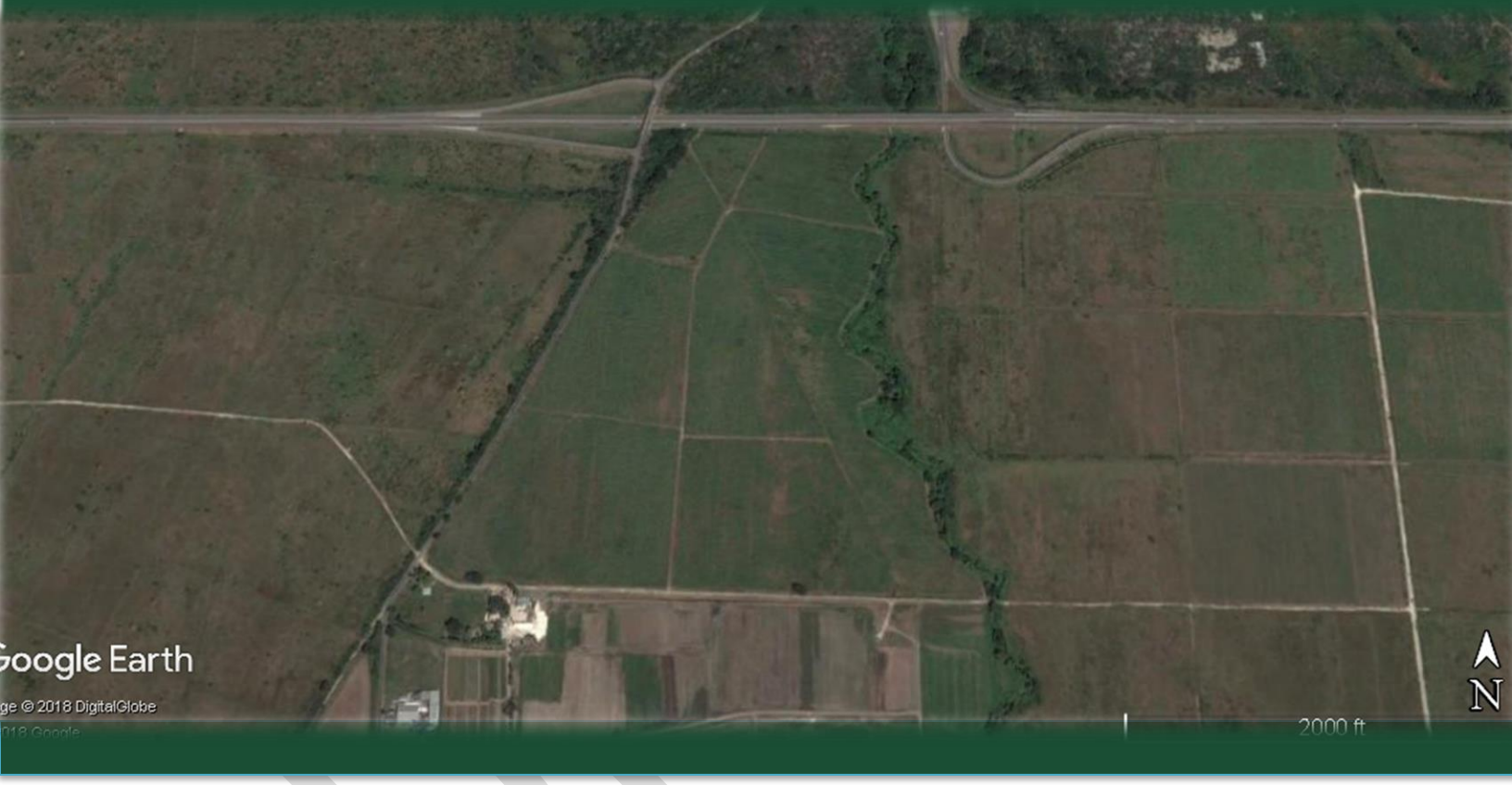
Caribbean Broiler's Hill Run Development:

Hybrid Growth Centre "The Nest"

St. Catherine, Jamaica

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT



Prepared For

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GLOSSARY

CLIMATE CHANGE Climate change is a change in the usual weather found in a place. Climate change is also a change in Earth's climate. This could be a change in Earth's usual temperature or it could be a change in a place's usual temperature for a month or season. Whilst weather can change in just a few hours, climate takes hundreds or even millions of years to change.

GREAVES The unmeltable residue left after animal fat has been rendered

HAZARD A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation.

HYBRID GROWTH CENTRE Caribbean Broilers' Hybrid Growth Centre is dubbed "The Nest" and is defined as:

- CB's new home which will be a place of rapid growth and development; an incubator of innovation.
- Though a single location, it will house three independent operations:
  - Hill Run Farms: Our R&D Farm for livestock, where we grow 2.5 million+ chickens and 7500+ pigs annually.
  - Harvest Hub: Our 500+ acre R&D Farm for our new crop division Imagination Farms.
  - ROC, "Revolutionary Operations Centre": Our new, world class poultry processing plant that we will be constructed over the next 24 months.

- While each operation will operate independently from a business point of view, they will rely on each other from an environmental perspective. CB believe' s this hybrid approach is a superior and more complete business model because it not only puts people first, but it increases operational efficiencies and reduces environmental impact.

HYDROLIZATION To cause a substance to split into component parts by the addition of water.

MITIGATION The lessening or minimizing of the adverse impacts of a hazardous event.

RECONNOITRE To examine or survey (a region, area, etc.) for engineering, geological, or other purposes.

VULNERABILITY The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards.

1 EXECUTIVE SUMMARY

Introduction

Environmental Solutions Limited (ESL) has been contracted by Caribbean Broilers (Ja.) Limited to undertake environmental permitting and the necessary environmental due diligence associated with the development of Jamaica's first Hybrid Growth Centre called "The Nest" at Hill Run, St. Catherine. This document is an Environmental Impact Assessment (EIA) prepared to support the proposed development as required by the National Environment and Planning Agency (NEPA). The EIA Project Team is presented in Appendix I. The EIA followed the terms of reference as provided by NEPA and presented in Appendix II.

Caribbean Broilers (Ja.) Limited (CB) a member of the CB Group (CBG) and a major producer of poultry products in Jamaica proposes to design, construct and operate 'The Nest'. Full development of this new facility is expected to span the next seven (7) years. 'The Nest' project site is already home to the group's Livestock Research Centre, and CBG plans to further develop its crop division, *Imagination Farms*, all slated for the Hill Run location. Though a single location, the Hill run property will house three independent operations:

- Hill Run Farms: Our R&D Farm for livestock, where we grow over 2.5 million chickens and over 7500 pigs annually
- Harvest Hub: Our 500+ acre R&D Farm for our new crop division Imagination Farms
- ROC, "Revolutionary Operations Centre": New, world class poultry processing plant that will be constructed over the next 24 months

The development will be supported by a partnership with the Jamaica Public Service Company (JPS) and New Fortress Energy (NFE). JPS will construct and operate a power plant fuelled by Liquid Natural Gas (LNG). NFE will supply LNG to the site daily and will also construct and operate the storage of a minimum of 5-days LNG on site as contingency.

Description of the Environment

<u>Physical</u>

Hill Run is a part of the southern St. Catherine plain and is located south of Spanish Town and the area of March Pen. Elevations across the greater area extend from a high of 21 m at the north of the project site, through 16 m at the outlet of the Town Gully by the farm area to a low of 10 m at the intersection of the Town Gully and the Hill Run road. Due to flat topography and the clay soils, the site and surrounding area is often affected by flooding during heavy rainfall events. Observations on the farm and discussion with personnel familiar with historical flood events have stated that there has been up to 1.2 m of water on the lower section of the farms but only standing or ponding water in the area where the plant is to be located.

With respect to air, noise and water quality baseline for the site, the particulate matter concentrations were within the NEPA ambient 24-hour standard at each sampling station, and noise levels measured were all well within the cited NRCA Noise Guidelines of 65dBA for all the sites tested.

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. Further, it is suspected that the NIC canal is influenced by industrial and/or commercial discharge.

Biological

The site has been used for agriculture for decades. The monoculture of sugarcane over these years have rendered the ecological significance of the specific project site very minimal.

Socioeconomic

The project site is situated in the Hill Run Community which is a small district within Cromarty, St. Catherine. Cromarty is divided into five (5) smaller districts; Cromarty Proper, March Pen/ Corletts Road, Hill Run, Duncan's Pen and Windsor Road. The area generally comprises a large farming district with activities including fish farming downstream of the project site, livestock rearing and cane farming. Public perception of the project from both the small community group meetings as well as the survey conducted showed that most persons are accepting of the project development within the area.

Impact Identification, Analysis and Mitigation

Following the assessment of the existing environment, the Consultants evaluated the aspects and impacts of the proposed project activities. Table 1 below summarizes the potential impacts and the main issues identified on the site and in the surrounding area. Proposed mitigation measures have also been presented for the impacts identified as potentially negative.

Table 1: Summary of the Potential Impacts and Mitigation Measures

Activities/ Main Issue	Potential Impacts	Mitigation Measures
Land Preparation and Construction Phase		
Vegetation Cover Removal of vegetation for land preparation	Loss of vegetation cover	• Clear only areas needed for construction of roads and other infrastructure

Activities/ Main Issue	Potential Impacts	Mitigation Measures
Air Quality Land clearing Improper storage and transportation of fine earth material Burning of vegetation and/ or construction/ domestic waste Fugitive dust from unpaved roads	Increase in air pollutants and dust Adverse health impacts on contractors, employees, residents and properties in surrounding areas	• Install Construction Dust screens around site • Frequently wet site to reduce fugitive dust • Re-grass or pave exposed ground as soon as possible • If development is done in phases, clear only land which is currently being worked on. • All fine earth material should be covered while stored on site. • There will be no burning of vegetation and/ or construction/ domestic waste on site.
Noise Land clearing activities Vehicular traffic Operation of Heavy equipment Operation of JPS Generators	Elevated Noise levels Adverse health impacts on contractors, employees, residents and properties in neighbouring areas.	• Temporary noise barriers can be erected as needed around specific activities anticipated to be very noisy, using plywood or any other absorbing material for the duration of that activity. • Ensure equipment is properly maintained • Work activity should be scheduled to control noise exposure. High noise areas should be identified, and appropriate personal protective gear worn. Stationary noise sources like generators and compressors should be positioned as far as possible from noise sensitive receivers such as workers. • Noise reducing measures in keeping with best practices should be used when installing the generators.
Drainage and Sedimentation Vegetation clearance Removal/blocking of existing natural drains Improper storage /disposal of construction	• Exposure of soil to erosion • Aggravated Sediment runoff • Damage to aquatic ecology • Disruption of natural storm water runoff • On-site and downstream flooding from blocked drainage ways • Pollution from leaching of construction spoils or other land-based activities	• Paving or grassing of exposed grounds as soon as possible • Excavated material should not be stored along drains, gullies, swales or in the path of natural drainage. Stockpiles should have a berm and should be covered. • Natural drainage should not be blocked without suitably engineered alternatives

Activities/ Main Issue	Potential Impacts	Mitigation Measures
material or refuse near to drains, or gullies		
Sewage Management Improper Disposal of sewage	• Odours • Contamination of water with pathogenic organisms • Spread of water borne disease • Pollution of receiving water bodies • Damage to aquatic ecology	• Portable toilets should be placed on the site for use by workmen • Workmen should be sensitized on how to use these facilities • Proper use and maintenance of facilities should be monitored
Solid Waste Management Dumping of earth material Dumping of waste from worker activities Dumping and disposal of waste from construction activities	• Blocking of drainageways • Breeding of vectors - public health nuisance • Site Aesthetics	• Appropriate storage of spoil has been mentioned above. • Design and implement system for solid waste collection and removal from site by licensed operators to approved disposal site.
Ecology Removal of vegetation Sewage and solid waste management Dust generation	• Potential ecological impact downstream of site if sewage and solid waste not manged to standard. • The generation of fugitive dust during transportation, site preparation and construction activities could coat the nearby vegetation with a layer of dust, reducing photosynthetic rate. • Though minor, the noise generated from site preparation and construction activities could negatively impact organisms that communicate using vocalization, for example, grasshoppers, tree lizards. • Crocodiles are known to be in the area and are attracted to areas of water ponding, the Town Gully and areas where a food source is available.	• Wetting of the construction site and materials during construction or until roads are paved will minimize the fugitive dust impacts on the surrounding vegetation. • Appropriate solid waste and sewage disposal as mentioned above. • An environmental management plan (EMP) should be prepared before the start of construction. This should include procedures for contacting NEPA should there be crocodile siting, and this should be fully communicated to all workers.

Activities/ Main Issue	Potential Impacts	Mitigation Measures
Employment opportunities	The availability of jobs is a possible positive impact anticipated from this development. In particular jobs will be available during the construction phase. Short-term disturbance related to crime and squatting due to large numbers of outside construction workers.	• Worker liaison officers to be deployed • Control of squatting on outskirts of project site. • Install appropriate security measures on property
Traffic and potential accidents	Increase in vehicular movement during the construction phase and the potential for accidents from trucks bringing construction material.	• Trucks should not be over-loaded, • Material should be appropriately covered. • Use screening mechanisms to ensure drivers are appropriately qualified to operate respective vehicles in order to reduce probability of accidents during the transport of construction material.
Operation Phase		
Air Quality Emissions from: • Stack of Protein Recovery Plant • Stack of JPS Power plant • Potential leaks from LNG storage tanks and pipelines • Vehicles	Elevated particulate levels can result in adverse health impacts on contractors, employees, residents and properties in surrounding areas Poor air quality may also have deleterious effect on adjoining farming operations. Visibility can be impaired	• Air dispersion modelling of emissions from the operation should be done and the necessary mitigative measures implemented. • Install stack scrubbers for the Protein Recovery Plant. • Install stack scrubbers or catalysts to remove oxides of nitrogen, carbon monoxide and unburnt fuel emission stack at the JPS Power Plant. • Gas recovery and leak detection systems in keeping with industry best practices should be a part of the NFE operations • Vehicles should be properly maintained to ensure they are always working optimally. • Periodic monitoring should be done to ensure compliance with the regulatory requirements and environmental best practice levels.
Noise Factory operations Vehicular traffic Trucking Heavy equipment	• Elevated noise levels on site • Elevated noise levels from adjacent road traffic	• Occupational Health and safety Standards should be implemented • All equipment and vehicles should be properly maintained • Buffer zones using trees can be used to reduce impacts of vehicular traffic from nearby busy thoroughfare

Activities/ Main Issue	Potential Impacts	Mitigation Measures
		• Noise assessment should be conducted during start up to identify areas where there may be elevated noise levels. Mitigative measures such as the use of noise reduction dampers should be implemented where possible • Workers should wear the appropriate personal protective gears.
Flooding	Overflow from the Town Gully will flood sections of Imagination farms south of the site but not the plant site. It is, however, important for the Town Gully just upstream of the plant site to remain clear in order to carry the flows beyond the plant site. The issue of protecting the farm from flooding needs careful consideration because of the downstream risk of flooding upon addressing this issue at Imagination farms.	• Maintenance of the Town Gully is not the responsibility of CB, but it is in the company's interest to liaise with the municipality to keep it clean enough to allow for adequate storm water transport away from the CB property. CB has to date held discussions with NWA who gave them the permission to clean the Town Gully from Highway 2000 in the north to the private road south of Imagination Farms and to straighten it in parts. This process is almost complete. • Involves periodically removing silt and debris and controlling the growth of vegetation within the channel of the Town Gully. • Control of the vegetation must be manual as herbicides cannot be used because of the downstream demands on that water for farming purposes including irrigation and aquaculture. • Floor levels in the plant must be elevated to a minimum of 150 mm above grade. • Access roads are to be at a minimum of 450 mm above grade.
Drainage and surface run-off	Sediments from areas without foliage during rainfall periods can result in flooding, infrastructural damage and siltation of receiving waters.	• All expose ground should be paved or grassed • Buffer zones near to gullies or other water ways can be established using trees, grass etc. to reduce sediments getting into these systems.
Water pollution due to sewage and trade effluent	Disposal of improperly treated or untreated sewage and/or trade effluent can potentially result in: • Emission of odours	• All sewage and/ or trade effluent should be properly treated to the tertiary levels prior to its discharge into the environment. • The treatment facilities used for sewage and /or trade effluent should be appropriately

Activities/ Main Issue	Potential Impacts	Mitigation Measures
	• Contamination of water with pathogenic organism. Spread of water borne disease • Eutrophication of receiving water bodies • Damage to Aquatic ecology	sized, designed, maintained and operated by trained personnel. • Scheduled monitoring of the effluent from the system should be implemented to ensure the treatment process is working effectively. • It is anticipated that the quantity of sewage produced by JPS will be estimated and this information given to CB incorporate in the final wastewater design. A good estimation of the type and if possible, the quality of the trade effluent generated from the wash down and maintenance process should be made by JPS. Effluent contaminate with fuel or chemicals will need pre-treatment prior to sending it the wastewater treatment plant.
Limited discharge into the Town Gully	Limited discharge into the Town Gully due to usage of treated effluent from WWT Plant for irrigation.	-
Solid Waste Management Solid Waste from Poultry Processing and Protein Recovery Plant	• Breeding of vectors - public health nuisance • Odour	• Should Protein Recovery Plant malfunction, processing would temporarily stop. Pipes from the Processing Plant will be redirected to the divert valves so that pumping of biological waste takes place directly into trucks going to landfill. • Should the Protein Recovery Plant fail temporarily, stand-by trucking would be "on call" to collect biological waste for immediate removal to landfill. • The Protein Recovery Plant will be a closed loop negative pressure building system to eliminate vectors.
Reduction of biological waste sent to landfill	Reduction in biological waste transported to landfill due to the introduction of the Protein Recovery Plant.	-
Human - induced hazards	The risk of technological hazards from the handling and storage of LNG Risks associated with daily transportation of LNG to the project site.	• It is important that pipelines, transporting vessels and storage systems for the natural gas be rated for zero leakage and designed as a closed system. Therefore, during operation of the facility there will be no leakages or spills of natural gas. The latest equipment provides for suction of disconnected volume. Hence, with the installation of safety equipment, the quantity of these releases

Activities/ Main Issue	Potential Impacts	Mitigation Measures
		will be very small and within NEPA's specified limits and will quickly disperse with the wind. • Adequate and proper maintenance of all pumps, valves and pipelines must be ensured to limit any fugitive natural gas emissions within acceptable limits. • Air dispersion modelling indicated above will include investigation of LNG impact on the ambient air quality. • Methane is the main constituent of liquified natural gas (LNG). This gas is not harmful to human and animals but in large concentrations it carries significant environmental risk due to its flammability and green-house effect. NFE should ensure that the gas recovery system to condense evaporated gas and the systems for fire and gas detection conform to industry best practices. • The training of staff to respond to system alerts and other emergencies should be ensured. The emergency response plan for the CB facility should incorporate procedures to deal with emergencies occurring on both the JPS and NFE properties. • Siting of the storage tanks should be considered with respect to risks from extreme events such as earthquakes and hurricanes. The topography of Hill Run makes it highly exposed to high winds as accompany hurricanes.
Natural Hazards and Climate Change	Due to the nature of geology and soils, the site is vulnerable to liquefaction as a result of earthquakes. Projected climate change impacts that are likely to affect the site as it includes more variable and intense periods of rainfall and more intense hurricanes. The site will be even more vulnerable to flooding. Tropical Cyclones may cause wind damage	• The site should be elevated above the influence of the flooding from the Town Gully. In addition, the building should also be elevated. The interior of the building should also be designed in such a way that if flooding does affect the site, critical equipment will not be affected. They should be water proofed and raised. See section 5.1.1.2 and 5.1.1.3 for further measures. • It is important to note that there are differentiated risks associated with horizontally and vertically positioned tanks.

Activities/ Main Issue	Potential Impacts	Mitigation Measures
		Some consideration should be given to the use of horizontal LNG tanks since there is a greater risk posed by hurricanes and storms with high wind speeds to potentially negatively impact vertical tanks.
Reduction in greenhouse gas emissions	The use of LNG to run the power plant instead of fossil fuels will reduce the carbon footprint of the CB and JPS operations. LNG burns 50-60% less carbon dioxide and produces minute levels of Sulphur dioxide and particulate matter. Given Jamaica's energy policy and strategic direction, this reduction in greenhouse gas emissions is a positive move nationally.	-
Ecology	Improper management of wastewater could encourage long term negative impacts downstream.	As indicated above this can be addressed through the proper treatment of effluent prior to any discharge into the Town Gully. Also, an EMP should be prepared for the operation phase so that the appropriate monitoring of effluent is done.
Employment	The availability of jobs is a possible positive impact anticipated from this development. Greater opportunity will be available during the construction phase than in the operation phase.	-
Traffic	Currently, traffic in the area is very light but with the development an increase in vehicular movement anticipated during the operation phase. This increase is not expected to result in congestion since the area is characterised by low density traffic.	-
Migration	Perceived and real employment opportunities will attract persons to the area in search of jobs. This may result in an increase in the number of persons living in the areas, but these workers will have minimal impacts on existing housing, water and other resources.	-
Help achieve Jamaica's objective for import substitution	CB's processing technology and safety has improved and as such they will be producing a better and more efficiently produced chicken product. This results in a higher production of processed chicken thus	-

Activities/ Main Issue	Potential Impacts	Mitigation Measures
	helping to achieve Jamaica's objective for import substitution. This may also result in a potential increase in exports.	
Health risks	Potential emissions from the JPS power plant and CB's poultry processing plant, if left unmitigated, can pose a possible health risk for surrounding communities should the wind transport emissions to residential areas north and south of the site at different times of the day. This can result in persons developing respiratory illnesses.	It is therefore imperative that CB and JPS implement mitigation measures outlined under Section 5.1.1.1 and 5.2.1.1.

Conclusion and Recommendations

In conclusion, based on the findings of the environmental impact assessment, the Consultant's professional option is that the project, once the recommended mitigation measures are followed, are not likely to result in significant environmental impacts. Both positive and negative impacts were identified for this project. Of the 17 potential impacts identified for the operation phase 5 are positive impacts and 2 are neutral. All of the 9 potential impacts identified for the construction phase and 17 identified for the operation phase, can be mitigated and are largely reversible.

2 INTRODUCTION

2.1 Purpose

Environmental Solutions Limited (ESL) has been contracted by Caribbean Broilers (Ja.) Limited to undertake environmental permitting and the necessary environmental due diligence associated with the development of Jamaica's first Hybrid Growth Centre called "The Nest" at Hill Run, St. Catherine. The proposed project is sited on a 100-acre property owned by the Caribbean Broilers Group (CBG) located in Hill Run in the parish of St. Catherine just south of the East-West corridor of Highway 2000 (Figure 2.2). This site is north of CBG's current >500-acre property, which is being used for Imagination Farms, chicken houses and pork barns.

This document represents an Environmental Impact Assessment (EIA) prepared to support the proposed development as guided by the Terms of Reference (TORs) received from the National Environment and Planning Agency (NEPA), which is presented in Appendix II. The following sections present the background and project description. Section 2 summarizes the policies, legal and administrative framework relevant to this project. Section 3 presents the methodology. Description of the existing environment is presented in Section 4, and Section 5 identifies the potential impacts and proposes relevant mitigation measures as needed. Section 6 summarizes the cumulative impacts and an assessment of alternatives is presented in Section 7. The EIA Project Team is presented in Appendix I.

2.2 Contextual Background

Caribbean Broilers (Ja.) Limited (CB) a member of the CB Group (CBG) and a major producer of poultry products in Jamaica proposes to design, construct and operate the Caribbean's first and only Hybrid Growth Centre.

The CB Group currently operates three (3) separate divisions:

- CB Foods – a vertically integrated farming, processing and distribution business that focuses on locally produced meats. The flagship brands are CB Chicken, Copperwood Pork and Smart Eggs.
- Newport Mills – operators of a feed mill providing small and commercial farmers livestock, technical services and animal feeds under the Nutramix brand.
- Imagination Farms – newest division which focuses on fresh produce, such as onions, peppers, and other crops, including West Indies Sea Island Cotton, to reduce imports and grow exports.

The Group plans to invest $10 billion in *The Nest,* "its new home" to further growth and development. 'The Nest' project site is already home to the group's Livestock Research Centre, which has begun testing new equipment, feed rations and growing techniques to improve farm practices.

This planned Hybrid Growth Centre will feature a new state-of-the-art Poultry Processing Plant, a Protein Recovery Plant, a Waste Water Treatment Plant (WWTP) and a Pork Processing Plant.

In 2011, CB was granted a permit from the National Environment and Planning Agency (NEPA) for the construction and operation of a Protein Recovery Plant at the company's property in Freetown, Clarendon. With this new Hybrid Growth Centre, CBG will now apply for environmental permits for this new location as well as for the construction and operation of a Wastewater Treatment Plant (WWTP).

2.3 Site and Situation of the Study Area

The study area is located in Hill Run, just south of the East West Corridor of Highway 2000 and south west of the Rio Cobre River (Figure 2.2). The property owned by CBG is approximately 55 hectares in size. 26.8 hectares of this property will be developed. A general 2 km buffer zone was taken into consideration as the study area when conducting this EIA. This assessment focuses on the proposed construction of the poultry processing plant and supporting infrastructure; the footprint is illustrated in Figure 2.1 below.

Figure 2.1: Aerial image showing proposed poultry processing plant footprint (red) within overall land parcel (green) in addition to the footprint of the existing CB facility(blue) across the road

Figure 2.3 (and Appendix III) illustrates the Master Plan Layout of activities on the site. The site has two entrances, the main entrance to the northwest of the development and a service entrance to the southwest of the development footprint. The north of the facility will accommodate staff parking, offices, bathrooms and other staff facilities.

South of the office area is the poultry processing plant and the protein recovery plant. To the east of the protein recovery plant is the Jamaica Public Service Company's (JPS) power plant and the storage of LNG by New Fortress Energy (NFE). The southeast of the site will house the wastewater treatment (WWT) plant and south of the WWT plant will be the well, which will supply the site with water. Three ponds are located on site which serve to harvest rainwater onsite. Pond 1 has a volume capacity of 1262m^3, pond 2 holds 750m^3 and pond 3 holds 3,956m^3.

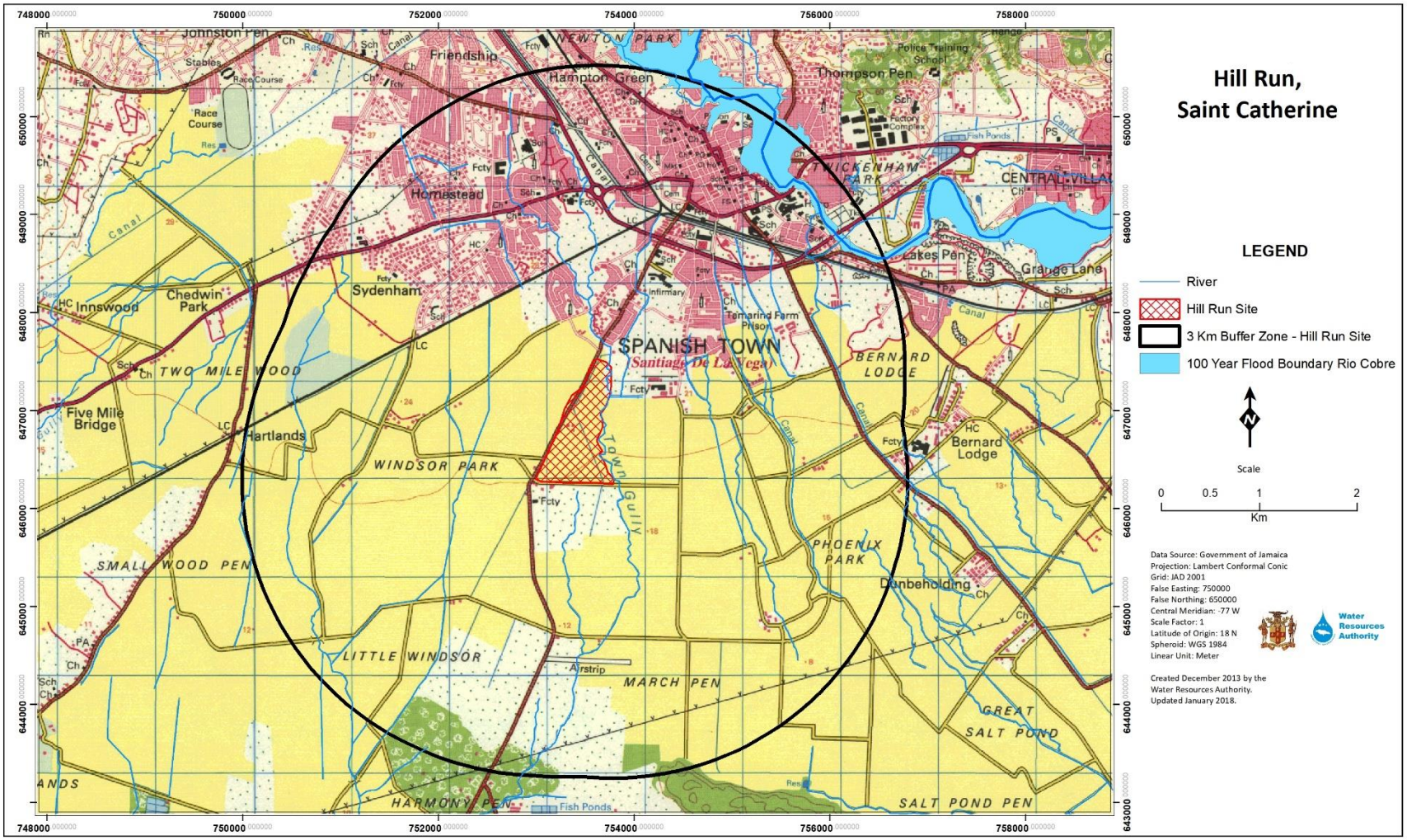

Figure 2.2: Location Map of Study Area - Caribbean Broilers' proposed Hybrid Growth Centre site (hatched red area in the centre of the map)

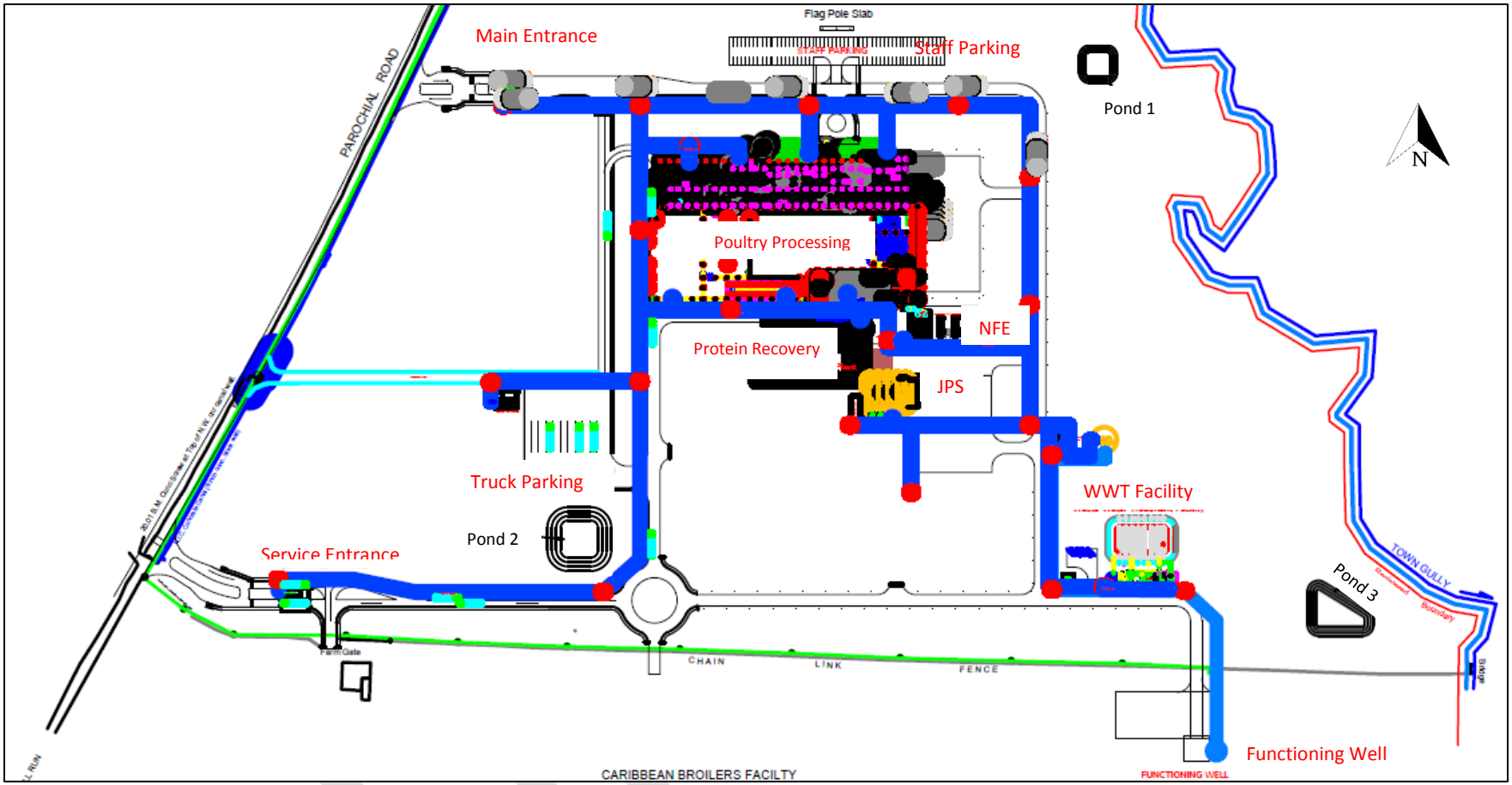

Figure 2.3: Master Plan Layout of the Caribbean Broilers Facility (See Appendix III)

3 POLICY, LEGAL AND REGULATORY CONSIDERATION

3.1 Policy

3.1.1 National Development Plan – Vision 2030

National Outcomes #12, 13 and 15 of the Vision 2030 are integral to this development being proposed. These are as follows:

No.	Outcome	Strategies	Related Hybrid Growth Centre Aspects
12	Internationally Competitive Industry Structures	➢ Develop company sophistication and productivity ➢ Develop economic linkages and clusters ➢ Develop economies of scale and scope through collaboration among enterprises in the region ➢ Enhance the framework for competition among enterprises ➢ Promote eco-efficiency and the green economy	All aspects especially the new processing plant and the protein recovery plant. The re-use of treated effluent for irrigation is directly linked to eco-efficiency.
13	Sustainable Management and Use of Environmental and Natural Resources	➢ Integrate environmental issues in economic and social decision-making policies and processes ➢ Develop and implement mechanisms for biodiversity conservation and ecosystems management ➢ Develop efficient and effective governance structures for environmental management ➢ Manage all forms of waste effectively	The Hybrid Growth Centre concept is based on the first and last strategies and is an excellent illustration of environmental underpinning in development and design. CBG has indicated that they are committed to ensuring that the effluent from their waste water treatment plant exceeds

No.	Outcome	Strategies	Related Hybrid Growth Centre Aspects
			the NRCA standards for effluent quality.
15	Sustainable Urban and Rural Development	➢ Create a comprehensive and efficient planning system ➢ Create an appropriate framework for sustainability planning ➢ Create sustainable urban centres, including urban renewal and upgrading ➢ Create vibrant and diversified rural areas ➢ Ensure safe, sanitary and affordable shelter for all	All aspects of this development are geared towards sustainable rural development.

3.2 Legislation and Regulations

Relevant legislation and regulations are presented below for those requirements relevant to the development at Hill Run.

3.2.1 Natural Resources Conservation Authority Act (1991)

The Natural Resources Conservation Authority Act was passed in the Jamaican Parliament in 1991 and provided the basis for the establishment of the Natural Resources Conservation Authority (NRCA) with primary responsibility for ensuring sustainable development in Jamaica through the protection and management of Jamaica's natural resources and control of pollution. Sections 9 and 10 of the NRCA Act stipulate that an Environmental Impact Assessment (EIA) may be required for new projects and existing projects undergoing expansion.

The NRCA Act binds the Crown and as such supersedes all other legislation relating to environmental issues. The Minister is empowered to request an Environmental Impact Statement (EIS) in relation to certain major projects.

Communication with NEPA indicated that they require an EIA for this development, as such, this EIA is being done to meet the requirements of this NRCA Act and support CBGs Permit Application.

3.2.2 The Natural Resources Conservation (Permits and Licences) (Amendment) Regulations, 2015

These regulations, developed in 2013, require the application for the grant of a permit to undertake an enterprise, construction or development of a prescribed description or category in a prescribed area as set out in Form 1 in the First Schedule.

CBG is therefore required to apply for a permit for the following:

1. ***Construction and operation of a Meat Processing Plant at Hill Run***
2. ***Construction of a Waste Water Treatment Plant at Hill Run to Support the development***
3. ***Operation of a Waste Water Treatment Plant at Hill Run to Support the development***
4. ***Discharge of effluent Waste Water Treatment as irrigation water at Hill Run***
5. ***Discharge of effluent Waste Water Treatment in Town Gully at Hill Run***
6. ***Construction and operation of a well water treatment plant***

The Jamaica Public Service (JPS) and New Fortress Energy (NFE) will also be operating on site to produce power and store Liquid Natural Gas (LNG) respectively. These CB business partners will also be required to and responsible for preparing and submitting the necessary Environmental Permit Applications for their proposed construction and operation activities.

3.2.3 The Natural Resources Conservation (Wastewater and Sludge) Regulations, 2013

Jamaica has prepared and enacted regulations governing the quality of the effluent discharged from facilities to public sewers and surface water systems. The regulation requires that the facility meet the outlined trade effluent and sewage quality standards set by the NRCA. The requisite permits and licences are required for the installation and operation of sewage treatment facilities and wastewater treatment systems. According to Sections 5, 6, and 7 the following apply for waste water treatment plants:

- ✓ Licence to construct a waste water treatment plant
- ✓ Licence to operate a waste water treatment plant
- ✓ Licence to a discharge effluent from waste water treatment plant

Since CBG is interested in all three of the above, a licence for each activity will be required. Following receipt of a permit, the developer would be required to monitor the effluent quality based on the frequency outlined in the terms and conditions of the licence and submit monitoring reports accordingly.

If effluent is used for irrigation it must meet the standards for sewage effluent for irrigation as presented in Table 3.2.1 below:

Table 3.2.1 Standard for sewage effluent to be used for irrigation

Parameter	Standard Limit
Oils and Grease	10 mg/L
Total Suspended Solids	1.5 mg/L

Parameter	Standard Limit
Residual Chlorine	0.5 mg/L
Biochemical Oxygen Demand (BOD_5)	15 mg/L
Chemical Oxygen Demand	<100 mg/L
Faecal Coliform	12 MPN/100 ml

The introduction of the regulations enables Jamaica to fulfil its obligations to the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (the Cartagena Convention) and enables ratification to the convention.

3.2.4 The Natural Resources Conservation Authority (Air Quality) Regulations, 2002

Part I of this Act stipulates license requirements and states that every owner of a major facility or a significant facility shall apply for an air pollutant discharge license. Part II speaks to the stack emission targets, standards and guidelines.

The Act states that no person shall emit or cause to be emitted from any air pollutant source at a new facility, any visible air pollutants the opacity or pollutant amount of which exceeds the standards.

Every owner of a facility with one or more air pollutant source or activity shall employ such control measures and operating procedures as are necessary to minimize fugitive emissions into the atmosphere, and such owner shall use available practical methods which are technologically feasible and economical, and which reduce, prevent or control fugitive emissions to facilitate the achievement of the maximum practical degree of air purity.

CBG and JPS will be required to employ emission control measures to minimize fugitive emissions from any stack.

The stack emission standards specified in the Twelfth Schedule shall apply to all new facilities with air pollutant sources. The regulations also define primary and secondary ambient air quality standards.

Table 3.2.2: Jamaica National Ambient Air Quality Standard

Pollutant	Averaging Time	Standard µg/m³	
Total Suspended Particulates	Annual	60	
	24hour	150	
PM10 (particulates with diameter <10 microns)	Annual	50	
	24hour	150	
		Primary	**Secondary**
Sulphur Dioxide	Annual	80	60
	24hour	365	280
	1hour	700	

Pollutant	Averaging Time	Standard µg/m^3
Carbon Monoxide	8hour	10,000
	1hour	40,000
Nitrogen Dioxide	Annual	100

3.2.5 Wild Life Protection Act (1945)

Section 6 of The Wild Life Protection Act (1945) states that "No person shall hunt any protected animal or protected bird. Every person who contravenes the provisions of subsection (1) shall be guilty of an offence against this Act. It is important to note that the American Crocodile (*Crocodylus acutus*) which has been spotted in the Hill Run community from time to time is a protected species as listed in the Third Schedule of this Act.

Crocodiles have been spotted on several occasions in the Hill Run Community and as such should any of these arise NEPA would need to be contacted so that appropriate mitigation measures can be employed to reduce any negative impact on these species.

3.2.6 Town and Country Planning Act (1958)

Section 5 of the Town and Country Planning Act authorizes the Town and Country Planning Authority to prepare, after consultation with any local authority, the provisional development orders required for any land in the urban or rural areas, to control the development of land in the prescribed area. In this manner, the Authority will be able to coordinate the development of roads and public services and conserve and develop the resources in the area.

In that regard, CBG has already sought approval from the Saint Catherine Municipal Council for the Development.

3.2.7 St. Catherine Development Order 1964

The St. Catherine Development Order has the area of Hill Run zoned for agricultural activities and forest reserves.

CBG's agricultural development is well within the existing zoning for the area.

3.2.8 Town and Country Planning (Saint Catherine) Provisional Development Order, 2017

The Town and Country Planning (Saint Catherine) Provisional Development Order, 2017 speaks to designated zoning and local planning areas specific to the parish of Saint Catherine. Section 6 of the Order speaks to the need for an application to be made to the local planning authority, in this case, the Saint Catherine Municipal Council, for development permission.

This Order also indicates that the area proposed for agro-processing is zoned for agriculture and therefore does not pose an issue for development.

CBG has already sought approval from the Saint Catherine Municipal Council for the Development.

3.2.9 Natural Resources Conservation Authority & Town and Country Planning Authority Guidelines for Developing a Natural Gas Sector Regulatory Framework 2015

The Natural Resources Conservation Authority & Town and Country Planning Authority Guidelines for Developing a Natural Gas Sector Regulatory Framework 2015 speaks to the scope of the proposed Gas Act for Jamaica, which will establish rules concerning the natural gas sector, in order to:

a. Initiate the development of the Natural Gas Sector, diversifying fuel choices in Jamaica
b. Encourage and promote private investment in the new sector
c. Introduction of competition in the provision of services for the supply of natural gas
d. Allow long-term access to consumers (domestic, commercial and industrial)
e. Ensure the protection and safety of consumers and people first, followed by the protection and preservation of the natural environment, assets and property
f. Encourage the development of energy efficiency in the natural gas sector
g. Establish and standardize the regulation of the natural gas sector.

The law and the regulations, standards and codes, must regulate the granting of permits and licenses to develop the activities, the project approvals and execution of the works. So far, this framework speaks to several main codes and international standards that are applicable and are currently in force in Jamaica, which should be taken into consideration for the design and construction of LNG and NG facilities.

The list includes: AGA – Natural Gas, ASTM - American Society for Testing and Materials, NFPA -Natural Fire Protection Association, and OSHA - Occupational Safety and Health Administration, just to name a few of those that would be applicable to NFE during their construction, transportation and operations related to Natural Gas Storage on site.

3.2.10 Public Health Act (1976)

The Public Health (Air, Soil and Water Pollution) Regulations 1976, aim at controlling, reducing, removing or preventing air, soil and water pollution in all possible forms. Under the regulations given:

- No individual or corporation can emit, deposit, issue or discharge into the environment from any source.
- Whoever is responsible for the accidental presence in the environment of a contaminant must advise the Environmental Control Division of the Ministry of Health and Environmental Control, without delay.
- Any person or organization that conducts activities which release air contaminants such as dust and other particulates is required to institute measures to reduce or eliminate the presence of such contaminants.
- No industrial waste should be discharged into any water body which will result in the deterioration of the quality of the water.

The excavation and construction work and use of heavy machinery and equipment may result in the temporary generation of fugitive dust. Proper care and standard best practices for the construction industry should be applied to minimize public health risks.

3.2.11 The National Solid Waste Management Authority Act (2001)

The National Solid Waste Management Authority Act (2001) is "an act to provide for the regulation and management of solid waste; to establish a body to be called the National Solid Waste Management Authority (NSWMA) and for matters connected therewith or incidental thereto". NSWMA is to take all steps as necessary for the effective management of solid waste in Jamaica to safeguard public health, ensure that waste is collected, sorted, transported, recycled, reused or disposed of, in an environmentally sound manner and to promote safety standards in relation to such waste. The NSWMA also has responsibility for the promotion of public awareness of the importance of efficient solid waste management, to advise the Minister on matters of general policy and to perform other functions pertaining to solid waste management.

Solid waste management will be essential in the construction phase and will require the removal and proper disposal of vegetative matter, soil and construction rubble. The NSWMA should be contacted regarding an approved disposal site.

3.3 Standards and Guidelines

3.3.1 Trade Effluent Standards

The Jamaica National Trade Effluent Standards, 1995, which governs the quality of the effluent discharged from facilities to public sewers and surface water systems is administered by the NRCA. ***These guidelines require that CB's facility meet the basic water quality standards for trade effluent including sewage.***

3.3.2 Noise Standards

Jamaica has no national legislation for noise, but World Bank guidelines have been adopted by the National Environment and Planning Agency (NEPA) and are used for benchmarking purposes along with the draft National Noise Standards that is being prepared.

4 METHODOLOGY & APPROACH

4.1 General Approach

Compilation of baseline information and assessment of key issues to help inform development decisions was the first step in executing the assessment. Team meetings were used to discuss the progress of investigations and analyses and to facilitate integration of data toward an understanding of the systems at work in both the natural and built environment.

The team of consultants conducted preliminary site investigations together to determine the dominant environmental issues relevant to the proposed development, the critical elements for analysis, and the issues to be highlighted for the design and planning process. Detailed field surveys to gather primary data on the project site were subsequently conducted. Other proposed developments and surrounding land use were also reviewed in the context of compatibility with the proposed project including potential positive, negative and cumulative impacts. The following subsections describe the approach for the physical, biological and socio-economic environment.

4.2 Physical Assessment

This section describes the methods associated with conducting the topographical, climate, hydrological, water, noise and air quality assessments of the site and its nearby surroundings.

4.2.1 Topography, Geology and Soils

The methodology and approach for assessing the topography, geology and soils of the site included:

- Field investigations
- Literature review
- Analysis of 1:50,000 topographic maps and Google Earth images

The soil analysis was completed using the 1:50,000 Geological Sheet #23. Ground truthing was also done during site investigations.

4.2.2 Climate

The methodology and approach for assessing the climate of the area was determined through review of data from the Meteorological Service of Jamaica and other published literature. Climate change projections from the Climate Studies Group at UWI were also reviewed.

4.2.3 Hydrology and Drainage

Hydrology and drainage were assessed via the review of literature, data and maps from the Water Resources Authority, the National Works Agency and Rural Physical Planning Unit.

Field visits were conducted to the proposed development site, the existing farm areas and to the areas around the site from the intersection of the NIC irrigation canal and the Town Gully near to the Spanish Town Toll Booth and south to the intersection of the Town Gully and the Hill Run road (Figure 2.2).

4.2.4 Water Quality

Water was collected for analysis from six (6) locations within the vicinity of the proposed location for construction (Figure 4.1 below). The water quality assessment was necessary to establish baselines for parameters of concern prior to the start of any development at the site and to provide preliminary information on the current state of those environmental receptors that are most likely to be impacted. The major objectives of the water quality assessment are described below:

- To determine baseline water quality conditions of the existing water bodies within the project site and potential zone of influence
- To assess the impact of current land use practices prior to the development of the CB processing plant

The six sampling stations were georeferenced for traceability and future monitoring requirements.

Selection of the sampling points was done considering the project sphere of influence. Sites both upstream and downstream of the project site were therefore selected. Table 4.2.1 below details the description of the water quality sampling stations.

Table 4.2.1: Water Quality Stations for CB Processing Plant - Hill Run

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

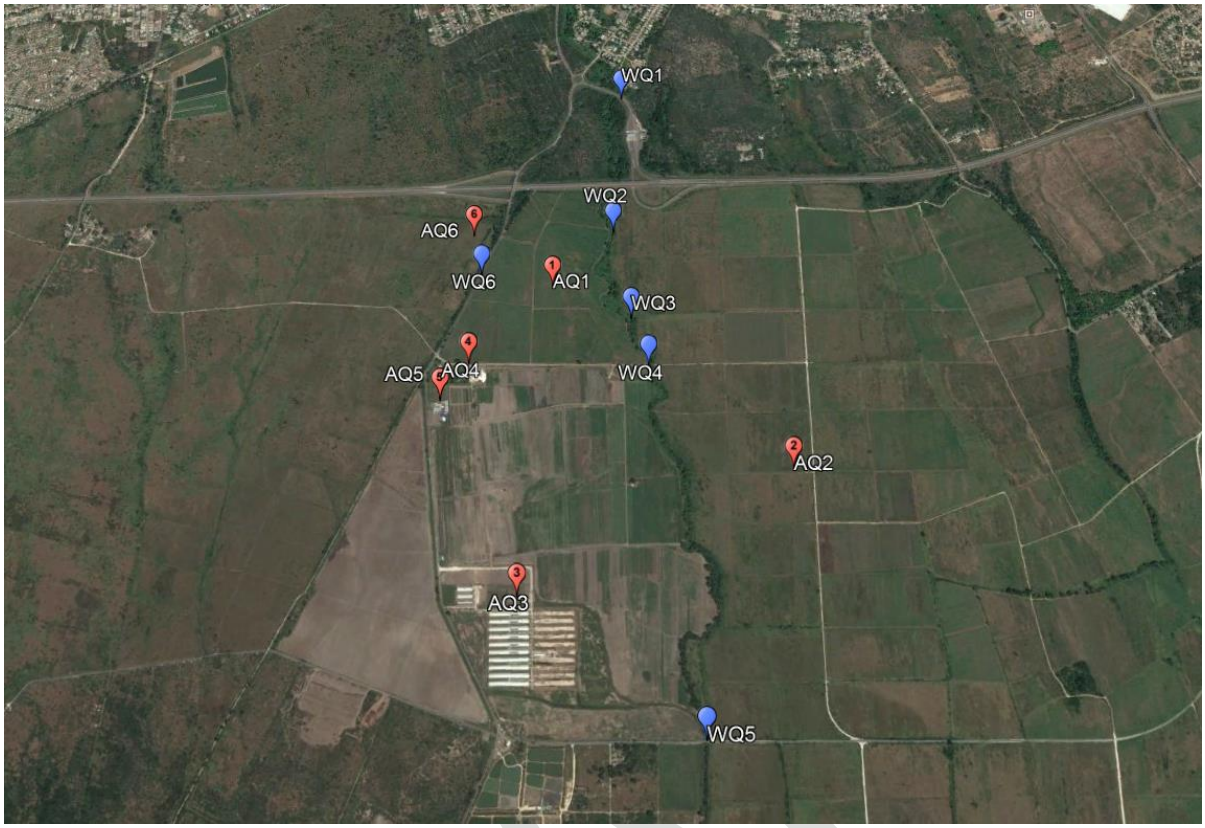

Figure 4.1: Location of Sampling Sites for Water and Air Monitoring Stations (WQ - Water Monitoring Sampling Sites; AQ - Particulate Matter and Noise Sampling Site)

The following WQ parameters (units given) were assessed during the exercise:

- Biochemical Oxygen Demand (mg O_2/L)
- Chemical Oxygen Demand (mg O_2/L)
- Nitrates (mg NO_3^-/L)
- Ammonia (mg NH_3 /L)
- Phosphate (mg PO_4^{3-}/L)
- Total Nitrogen (mg N/L)
- Sulphate (mg SO_4^{2-}/L)
- Chloride (mg Cl^-/L)
- Salmonella (presence/Absence)
- Total Suspended Solids (mg/L)
- Nitrate as Nitrogen (mg N/L)
- Total Coliform (MPN/100ml)
- Faecal Coliform (MPN/100ml)
- *E. coli* (MPN/100ml)
- Fats Oils and Grease (mg/L)
- Alkalinity (mg/L)
- pH (pH Units)
- Salinity (ppt)
- Dissolved Oxygen (mg O_2/L)
- Turbidity (NTU)
- Calcium (mg Ca/L)
- Magnesium (mg Mg/L)
- Potassium (mg K/L)
- Sodium (mg Na/L)
- Arsenic (mg As/L)
- Chromium (mg Cr/L)
- Copper (mg Cu/L)
- Lead (mg Pb/L)
- Mercury (mg Hg/L)
- Iron (mg Fe/L)
- Zinc (mg Zn/L)
- Pesticide Screen (mg/L)

The water samples were collected below the surface of the water at an appropriate depth to obtain a representative sample. Depending on the test parameters, some of the sample containers were rinsed thrice with the water to be collected before the actual sample was collected. The samples were collected where the water was well mixed, far enough from points of significant inflows.

Samples collected were kept at 4°C and transported to the ISO/IEC 17025 Accredited Quality and Environmental Health Laboratory at Environmental Solutions for analysis within the analysis hold time for each test parameter.

Field observations were made at each site with respect to smell, colour. *In situ* measurements were made with respect to Salinity, temperature, pH, conductivity, total dissolved solids and dissolved oxygen using a calibrated YSI Proplus Multi-parameter system (MPS).

Quality Assurance

A quality assurance (QA) and quality control (QC) plan involving all aspects of the project was instituted. This QA/QC plan forms an essential first step to generating data of the highest quality and reliability. The programmed comprised the care and calibration of field equipment and the collection and preservation of samples.

The sampling programme included grab sampling and the sample types were properly identified. The sampling team recorded the time, ambient conditions and sample description at the time of collection (Table 4.2.1).

The quality control procedures in the laboratory included analysis of blanks, reference standards and duplicates as well as the utilization of verified standard analytical test procedures. In all cases, appropriate chain-of-custody records were prepared and maintained for all analytical samples. All containers were properly labelled, individually packaged, stored and transported in a cooler, packed with ice.

4.2.5 Air and Noise

Particulate matter is the term given to small solid or liquid particles suspended in either a gas or liquid. The size of these suspended particles not only determine the lifespan of the particles within the atmosphere but also the effects on living systems if inspired (breathed in). The size range of concern to human health lies between 0.1-10 µm and are referred to as Respirable Particulates (PM_{10}). Effects of the exposure of PM_{10} on human health include but are not limited to: deleterious effects on the respiratory systems, damage to lung tissue, cancer, and premature death; the age, gender and health of the individual will determine the extent of these effects.

To minimize the potential impact of particulate matter on the health of people and the environment the United States Environmental Protection Agency (US EPA) has published a national air quality standard which states that the maximum daily concentration of PM_{10} should not exceed 150 μgm^{-3}. A similar 24-hour ambient standard is adapted by the local regulatory agency, the National Environment and Planning Agency (NEPA).

Particulate matter was measured using calibrated pumps (with flow rates 1-5 and 5-15 L/min), attached to pre-weighed Polyvinyl Chloride (PVC) filters. The pumps were calibrated with a calibrated DryCal DC-Lite primary flow meter from Bios International Corporation prior to use.

Measurements done were for a 24-hour period after which the monitoring devices were collected and returned to the laboratory where the filters will be stabilized and weighed to determine a Time Weighted Average (TWA) value for the particulates.

The results at the end of the sampling period were compared with National Environment and Planning Agency (NEPA) and the US EPA Ambient Standards.

Noise Assessment

Noise level readings were averaged over a 3-minute interval and the average noise level recorded in decibels (dBA). Wind direction and any unusual local noise sources were recorded at each sampling location. Noise measurements was taken using Quest SoundPro SE/DL series sound level meter, which conforms to the, IEC 616721-1-2002 Class 2, Sound Level Meter Type 2, ANSI S1.4 – 1983 (R2001) Octave Band &1/3 Octave Band Filter Class 1, IEC 61260:2001 Octave Band & 1/3 Octave Band Filter Class 1, ANSI S1-11-2004 and ANSI S1.43 -1997 (R2002) Type 2 standards. The noise meter was calibrated before and after each set of readings with a calibrator, which is pre-calibrated at the factory. The results at the end of the sampling period was compared with National Environment and Planning Agency (NEPA) Standard of 65dBA for Commercial Area since the predominant activities around the project site is agricultural related.

Baseline noise measurements were taken at identified sensitive receptors in the project area. In all instances the sampling location for the noise measurements coincided with the sites selected for ambient air quality measurement.

Site Selection

The objective of the air quality baseline investigation was to determine the normal concentration of respirable particulates in the project area. The selection of the sampling points was done with regards to the meteorological conditions. Receptor sites located downwind of the project sphere which may be affected by the activities on the project site were selected along with stations located upwind of the project area. Air quality measurements were taken at six (6) sites in the project area and its environs. The air monitors were placed away from any known sources to prevent bias in the data collected. Each sampling station was geo-referenced for traceability and future monitoring requirements (See Figure 1).

Description of sampling locations are given below in Table 4.2.2.

Table 4.2.2: Air Quality Monitoring Sites at CB –Hill Run

Sample Site	Description	GPS Coordinates (Decimal, Minutes, Second)	Observations
AQ1	Flag pole on Project Site	17°58'9" N, 76°57'3" W	The sampling site is the first flag pole south west of the highway. Environmental conditions were sunny with partly cloudy skies and light north-westerly winds. The soil was dry and the land around the sampling location was cleared of vegetation. Background noise included string resonating on flag pole and the rustling of leaves in the wind.
AQ2	Canfields East of Project Site	17°57'42" N, 76°57'31" W	The pump was placed on a tree located south east of the project site. Environmental conditions were sunny with partly cloudy skies and light north-westerly winds. The area was covered with grass and shrubs. The clay soil appeared dry. Background noise was from bees and occasional birds singing.
AQ3	Security Guard House on Livestock Farm	17°57'26" N, 76°58'9" W	The pump was placed on a container type building with syphon facing the north. Environmental conditions were sunny with partly cloudy skies and little to no wind in a NW direction. The ground was covered with grass.
AQ4	Imagination Farms- offices	17°57'58" N, 76°58'15" W	Environmental conditions were sunny with partly cloudy skies and light north-westerly winds. Sections of the fields were being cleared for cultivation while other areas were in cultivation. The roads to Imagination Farms and the yard were unpaved. Background noise included tractors in the field, people chattering and compressor in operation.
AQ5	Agro-Chem- Storage Container	17°57'53" N, 76°58'19" W	Agro-Chem is located on the NW border of Imagination Farms. The storage container is located on the eastern side of the property. Agro-Chem is surrounded by Imagination Farms to the north east and south. A paved road is to the west. Farm lands are beyond the roads. Environmental conditions were sunny with partly cloudy skies and light to moderate north-westerly winds. Background noise included a playing radio and machinery on Agro-Chem property.

Sample Site	Description	GPS Coordinates (Decimal, Minutes, Second)	Observations
AQ6	Open lands West of project site	17°58'17"N, 76°58'14"W	The sampling site was a cleared tree branch. The land is covered with overgrown grass, shrubs and trees. Piles of horse and cow dung were observed all over the sampling area. The area was formally used to cultivate cane. Environmental conditions were sunny with partly cloudy skies and light north-westerly winds. Background noise primarily vehicular traffic from highway.

4.3 Ecological Assessment

The Ecological Assessment was broken into two (2) sections, each with a goal to focus on ecologically significant areas within a 500m radius of the proposed development site (See Figure 4.2). The first was the desktop review, while the second was a site inspection to confirm the locations of ecological significance identified, and to evaluate the project footprint and activities within context.

Desktop Review:

Desktop review of satellite imagery showed that the site was not vegetated and has been used for agricultural purposes for many years. Areas where vegetation was concentrated were identified.

Site Inspection:

A site inspection was conducted on January 17, 2018 to determine the ecological baseline. The concentration of the vegetation within specific areas required a modified field assessment methodology. The areas were relatively small and were concentrated.

The entire site was traversed, with emphasis on the project footprint in addition to previously identified vegetated areas within the property. Identification walk-throughs of 100 – 200m were done at each of the identified sites to determine species composition and relative abundance using the DAFOR method of classification. Species lists of flora and fauna observed were generated from observations made.

The potential ecological impacts related to the proposed development were then identified and assessed to make recommendations to minimize the identified ecological impacts during both the construction and operational phases of the development.

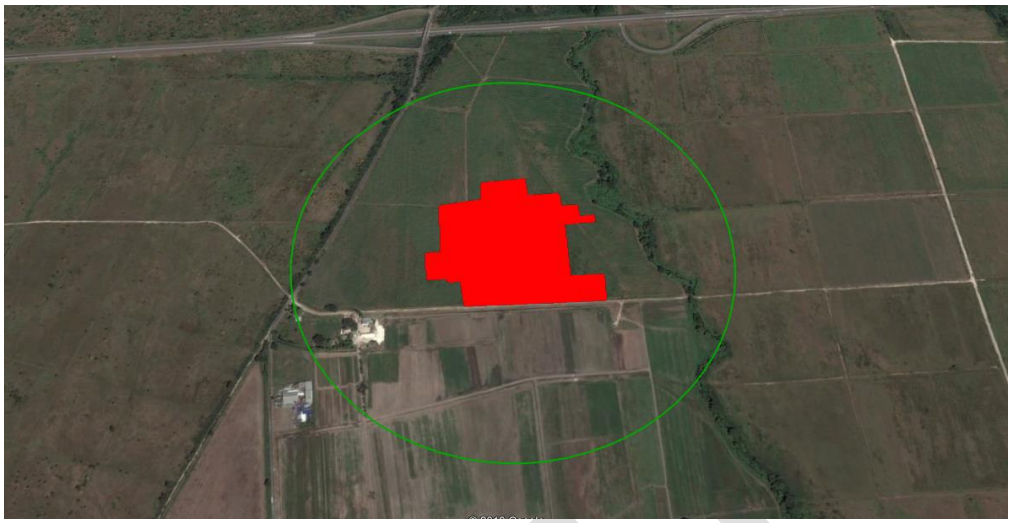

Figure 4.2: Image showing 500m radius (green) around the project footprint (red) within which the Ecological Assessment of the site took place

4.4 Socioeconomic Assessment

The proposed project will have an influence on the surrounding community and at the same time the local social environment might impact the project. As such, the main purpose of the socioeconomic analysis was to place the proposed project within the context of the local human environment to determine the existing socioeconomic setting and the potential impacts discerning negative and positive influences.

The project was examined within its more local geographic setting, at Hill Run. The methodological approach to this assessment was in keeping with the databases available and needed to support proper analysis and useful findings and included the following main methods.

- Desk Research
- Stakeholder Mapping and Analysis
- Rapid Appraisal which was focused on the conduct of Key Stakeholders and Informants Interviews.

Desk Research: Desktop research and review of earlier environmental studies associated with the specific site or closely related areas helped to put the development project into its local context. These are referenced. Demographic and housing data from the Statistical institute of Jamaica (STATIN) were also acquired to inform this assessment.

Rapid Appraisal

a) Community Group interviews

This involved firstly a windshield reconnoitre of the general project area, focusing on those established communities determined to be most immediately influenced by the project. The project is located in the Cromarty District, wherein Hill Run is one of 5 small communities which make up the district. Within this district the three communities below are closest, within 1-2 km of the project site:

1. Hill Run Proper
2. Cromarty Grove
3. Windsor Road (south)

This was determined as the sphere of influence. The consultant made contact with the Hill Run Citizens Association and the Cromarty Grove Citizens Association which are the two established and active groups within the sphere of influence of this project. Following contact made, the Consultants conducted two (2) community group sessions: one (1) in Hill Run and the other in Cromarty Grove. The residences along Windsor Road are not a part of an organized community body and as such opinions were randomly sought by speaking to person in the area. These group sessions and interviews probed for existing and potential issues and was guided by the Socioeconomic Questionnaire presented in Appendix IV. This was considered sufficient to bring into focus those positive or negative impacts that the community membership was likely to perceive for the project.

b) Key Stakeholder and Informants Interviews

In depth structured and non-structured interviews with targeted key stakeholder agencies were held. Some key informants were pre-selected for interviewing based on their knowledge of:

- The socioeconomic impacts of large developments on near communities.
- The likely impact of communities on near developments.
- The planning considerations that attend negative impacts and the best practice opportunities for creating benefits

A list of these key stakeholders and community residents consulted in the group meetings is referenced in Appendix V.

In addition to the group meeting a public perception survey was conducted wherein a total of 219 responses were received. Appendix VI shows a sample of a few of the completed questionnaires.

Public Hearing

A Public Hearing is required by NEPA to take place before the final report and its primary purpose is to present the findings of the EIA for wider public discussion. This provides another opportunity for the public to provide their comments and suggestions for the project. Further, public opinion at this point would be included in the final report.

This will take the form of a large community meeting, which must be preceded by a requisite twenty-one-day notification period in the media, letters of invitation to stakeholders, Non-Governmental Organizations (NGO's); Government agencies and the community. During the notification period, copies of the EIA Report will be made available for public review at the Parish Council Office, the Parish Library, the Documentation Centre at NEPA and the office of the project proponent. The meeting will be recorded verbatim and a separate report to be prepared for submission to NEPA. This report will contain relevant information on the proof of notification of the meeting (such as newspaper advertisements); the list of

invitees; the agenda; any presentations made; and the question and answer session. At the end of the Public Meeting, the public is given a thirty (30) day period in which to send comments to NEPA. In addition to the EIA Report, NEPA and its sister agencies will review the Report of the Public Meeting and any comments received before deciding on issuing a permit

5 PROJECT DESCRIPTION

On August 18, 2017, the CB Group had a ground-breaking ceremony for the project to date, *"***THE NEST"**- the Group's first *Hybrid Growth Centre*. Three independent operations are located on the Hill Run property:

- Hill Run Farms: The R&D Farm for livestock, where over 2.5 million chickens and over 7500 pigs are grown annually
- Harvest Hub: The 500+ acre R&D Farm for the new crop division Imagination Farms
- ROC, "Revolutionary Operations Centre": New, world class poultry processing plant that will be constructed over the next 24 months

This larger, more efficient chicken processing plant (ROC) is expected to enhance CBG's current export numbers as the company explores relationships with Caribbean countries that purchase most of their poultry meats outside of CARICOM.

The Caribbean Broilers Hybrid Growth Centre comprises four main components, which will be developed in two phases. Phase I will include the construction and operation of a Poultry Processing Plant, a Protein Recovery Plant and a Waste Water Treatment Facility that is slated to commence construction by July 2018 and with the existing Processing Plant in Kingston closing in the first half of 2019. The development of additional processing capacity to include pork and other small ruminants will occur in Phase II. The subject of this assessment is Phase I.

5.1.1 Phase I

5.1.1.1 Poultry Processing Plant

CBG currently operates a poultry processing plant located at the junction of Arnold and Percival Roads in Kingston. The facility is comprised of the processing factory, external sheds, storage areas, parking and administrative facilities. This plant has long outgrown its size and technology.

A modern technology-driven facility will allow CBG to develop and introduce bold new ideas using state-of-the art technologies and concepts, thus providing consumers with more choices and premium products of consistently excellent quality. A new processing plant will allow CBG to:

- Improve current process efficiency
- Develop new products
- Design new items for the currently mature market

The Poultry Processing Plant is designed to process approximately 100,000 birds per shift (9 hours). Energy requirement for the plant will be generated from a dedicated JPS LNG plant that will be located at the property, with excess capacity distributed back to the national grid.

Potable water will be made available from onsite wells with the water being treated to potable water standards, through chlorination and softening mechanisms. Rainwater harvesting will be employed as means of channelling storm water generated at the facility.

The birds will be air chilled as against water chilled which will result in significant reduction in water usage at the Plant. In addition, water used during processing will be recycled and reused in the sanitation process. Sewage water will also be harvested and treated and reused for irrigation purposes on the Farm.

Biological waste generated from the Poultry Processing Plant will be further processed at the Protein Recovery Plant that is described in more detail below.

With increased automation, the Plant will operate using a total of approximately 100 persons per shift. The operations will continue from Monday to Friday.

5.1.1.2 The Protein Recovery Plant

The biological waste including blood, feathers and offal generated from the Poultry Processing Plant will be further processed at the Protein Recovery Plant. Offal obtained from slaughtering livestock can be processed into a meal and fat which contains valuable ingredients. The Haarslev Protein Recovery System is a modern and simple system for processing waste from poultry processing plants. It recycles poultry offal, feathers and blood into poultry meat meals or mixed poultry meal, as well as valuable poultry fat.

Sterilization/ hydrolyzation will be carried out under pressure. Drying to the final moisture content takes place by means of continuous heating. To prevent public nuisance and pollution of the environment, vapours are condensed in a specially designed condensation system to reduce cooking vapor smells and are further reduced by use of chemical washing.

The Protein Recovery facility will operate out of its own building and is expected to generate its own income. This facility will have the capacity to process more than approximately 23,000 tons of material per annum when processing 100,000 per 9-hour shift, which currently goes to the landfill.

5.1.1.2.1 Receiving Area for Protein Recovery Plant

Feathers are received by pipe at the CB slaughterhouse feather press 2P01 which drains and then presses the transport water out of the feathers before they emerge from press and drop into the Feather Bin of 40 m^3. No reception by truck or other means is foreseen in this option.

Drained offal is received via the CB slaughterhouse offal transfer system at the drain screw conveyor to separate water, and then drop in the offal bin of 40 m^3. No reception by truck or other means is foreseen in this option. Blood is received in tank from slaughterhouse transport system.

5.1.1.3 Cooker Section

The batch cookers are mounted on weigh cells which allows precise loading of the different amounts of by-products in each batch. Therefore, a consistent quality is achieved batch to batch. The cooker may be loaded with either feather/blood mixture or offal depending on material available.

The batch of by-products is heated indirectly by means of steam condensed in the jacket and the agitator of the cooker/drier. Drying to the final moisture content is affected through continuous heating under atmospheric pressure. Hydrolyzation of feathers under pressure will take place in the batch cooker if required.

Discharge of the dried products will take place by one of two ways:

- From the front valve to send product to the offal pressing line for separation of proteins from fat.
- From the underneath valve to feed the feather meal line, or alternatively the bottom valve to send product to the feathers line.

5.1.1.4 Condensation

Vapours released from the cooker/drier pass through a cyclone before passing to a shell condenser to produce hot water and/or to an air-cooled condenser, to condense the vapours and cool the condensate. Condensed water will flow to the WWT. Non-condensable gases are extracted from the condensate water by means of a fan and are taken to the odour treatment system, a chemical washing system to treat the incondensable gases.

5.1.1.5 Poultry Meat Meal Line

Press Section

When the contents of the cooker/drier have been dried, the front discharge valve of the cooker/drier is opened. The greaves discharge into a front receiving bin. The cooker valve is shut, and the cooker may be loaded again. From the bin material is transported by drain screw to the press.

Fat drained off in the drain screw is transported by pump to the fat refining line. The greaves enter the press via an inlet chute fitted with a permanent magnet to remove any ferrous particles, which might damage the press. In the press the fat is separated from the greaves under pressure.

From the front of the press emerges the low-fat content meal. From the back of the press emerges the press fat mixed with fines. The fat gets transported by drainer screw for removal. Fines are recirculated to the press.

Fat Handling Section

The fat pressed in the press is transferred to a feeding tank. The fat is then refined via a decanter and then once refined; it is pumped and stocked in a fat storage tank.

Meal handling line

Meal from the front of the press passes into screw and subsequently into the hammer mill. Inside the hammer mill the meal gets ground to a consistent size. Finally, the meal is transported by the screw conveyor to the bagging system for big bags.

Electrical Panel

The electrical panel has PLC panel which controls the operation of the plant. The operators can visualize the processes on screens from where they may operate the equipment as well as supervise the process. From the screens the various set points for the process may be adjusted and alarms logs give information about any incidences in the Plant.

5.1.1.6 Feather Line

Feather and Blood Meal Line

After drying, feather and blood-meal is discharged from the batch cooker via the underneath valve to screw which takes the meal to the mixing cooling bin where the meal is left agitating in air for several hours to cool down.

Thereafter, cooled meal is passed via screen to remove lumps and plucking fingers to a Hammer mill and then at 2H14 big bags point.

Future Equipment

Space is left in the plant for easy addition of a third continuous cooker to increase the capacity.

5.1.1.7 Technical Data and Consumption Rates for By-Product Processing System

5.1.1.7.1 Electricity

- Motor current: 415 V, 3 phase, 50 Hz
- Total installed power (approx.): 705 Kw

5.1.1.7.2 Steam

- Steam with a pressure 8 to 10 bar (measured at the inlet of the cooker/drier) is required.
- Steam consumption at peak rate, offset loading of cookers
- For 1 x Cooker type 16,000 l: 5.5 tonnes/hr.
- For 2 x Cooker type 16000 l (one at peak rate, the other one not): 8.3 tonnes/hr.

NOTE: Peak rate occurs for a period of 20 minutes during the process. The process can be synchronized in a way to have just one of the 2 x cookers at peak rate at the same time.

NOTE: A.m. figures are average figures, which may differ, depending on actual practical circumstances.

5.1.1.7.3 Chemicals Reactive for Chemical Scrubbers

The chemicals scrubbers need to be fed with:

- ✓ NaOH concentrates to 25%
- ✓ And NaClO concentrate to 15%

The Chemicals feeding tanks are excluded from Haarslev supplier. That needs to be delivered in 1000L containers by the local chemical supplier.

5.1.1.7.4 Process Clean Water

The Haarslev Protein Recovery Plant will need clean water for decanter, fat press, chemical scrubbers and cleaning process of the floors and protein recovery installation - optionally to produce hot water in the heat vapor interchange.

- ✓ Requested pressure service: minimum 3 bars
- ✓ Quality water: Soft clean water

5.1.1.7.5 Air Pressure

- ✓ The Haarslev Protein Recovery Plant will need pressurized air for pneumatic process valves.
- ✓ Requested pressure service: minimum 8 bars.

5.1.1.8 Water Supply

Water will be supplied to the plant via an already existing onsite well. This well water will be treated through the processes:

- Filtration to remove sediments
- Chlorination to disinfect and remove microbes
- Softening via the use of salt
- Reverse osmosis to create potable water where needed

5.1.1.9 Solid waste

General solid waste will be stored in a designated area on site in a skip. An approved contractor will be hired to collect and dispose of the garbage at the approved disposal site.

All solids from the poultry processing plant will go into the Protein Recovery Plant where there will be no solid waste. Liquids from both the processing and Protein Recovery Plant will go to the wastewater treatment plant on site.

5.1.1.10 Wastewater Treatment Facility

CBG will undertake a two phased approach to the implementation and management of the wastewater treatment plant. The technology described in Phase 1 below will be installed. During a 6-month commissioning timeframe, the effluent from the plant will be monitored. The results will be compared to NEPA's trade effluent quality standards, should the effluent results not meet the requirements, a second tier of treatment will be installed as described below. CBG is commitment to introducing phase 2 within one calendar year after start-up of the processing plant for commercial purposes, should this become necessary.

Phase I Wastewater Treatment

At the Caribbean Broilers plant, water used during production and in the cleaning of production equipment, and surfaces within the plant, which we refer to as process wastewater, requires physical clarification prior to biological treatment. The IPEC rotary drum screen and FRC DAF systems comprise this physical separation step. The clarified effluent of the IPEC/FRC treatment system is then combined with sanitation wastewater used in the operation of sinks, toilets, water fountains, and consumer devices, for biological treatment prior to final discharge. Effluent from the Processing Plant will be treated by the proposed Waste Water Treatment Plant.

Current water consumption and the existing Arnold Road Processing Plant equates to approximately 1.9 million gallons of water per week or 96 million gallons annually. Currently, no waste water is harvested for reusable purposes. This plant will enable CB to treat its wastewater resulting in a 100% reuse. Therefore, another benefit of the water treatment plant is that CBG will be able to recover and reuse as much of the water that is needed for other processes on the Campus (for example, truck washing, outdoor sanitation and irrigation for agricultural crops).

The rotary screen and DAF system serve to remove fine, emulsified and recalcitrant solids from the process wastewater stream. It does not remove dissolved material, which include phosphorous and nitrogen compounds. For this purpose, it will be combined with the sanitary wastewater stream for biological treatment. In contrast to the process wastewater stream, the non-dissolved contaminants of the sanitary wastewater consist of large and robust particles, which are easily removed with a simple in-channel screen. The dissolved materials in both streams serve as a substrate for bacterial growth in the biological treatment system. Microbial metabolism of the dissolved material yields insoluble by-products, which are effectively removed by a settling clarifier. The effluent from the settling clarifier may then be discharged to the environment after disinfection.

It is proposed that sludge coming from the DAF, which is highly organic with feathers and other parts will be trucked away by an approved Contractor for disposal. It is anticipated that approximately 5 tons of this sludge will be produce per day for disposal.

Phase 2- Wastewater Treatment

This Phase 2 system will have a recycle stream and will require external dosing of carbon (ethanol) and alkalinity.

a. Making a pre-anoxic lagoon or zone of reasonable size (around 30 % of the total volume) This extra lagoon has already been incorporated into the existing lagoon design. (I.e. the lagoon will be 30% larger than first designed, just in case we need to go to phase 2.
b. Maintain simultaneous denitrification with the DYNOX system initially proposed.
c. Introduce a post-anoxic or intermediate anoxic zone in the lagoon (retention time is approximately 2 hours)
d. Introduce Carbon in both the pre/post anoxic zones. Expected rates would be approximately 120 mg/L or about 140L/day.
e. Introduce Alkalinity. Estimated between 250-300 mg/L
f. Recycle stream from post anoxic zone to pre-anoxic zone.

Based on the above set up we would need at a minimum:

- One (1) Lagoon, divided in 4 sections by 3 baffle walls:
    - Section 1 Pre-Anoxic (Length 20 m)
    - Section 2 Oxic (length 28 m)
    - Section 3 Post anoxic (length 5 m)
    - Section 4 Post-oxic (length 6 m)
- The total size of the lagoon would be L x w = 59 x 38.5 m, which is about + 5 m more than before.

- The recirculation pump should have a capacity of around 1,000 m3/h and should be VFD controlled. This would be about 30 – 40 kW and probably need to be split into two or three pumps.

- Mixers will be needed in both the Pre-anoxic and Post-anoxic section. Estimated mixer sizes in the pre-anoxic will be approximately 2 x 7.5 kW and post-anoxic section will be approximately 2 x 3 kW.

- There will be 3 floating baffle walls. These are commonly made from Polyethylene.

See Figure 5.1 below showing the schematic of the process overview for this phase 2.

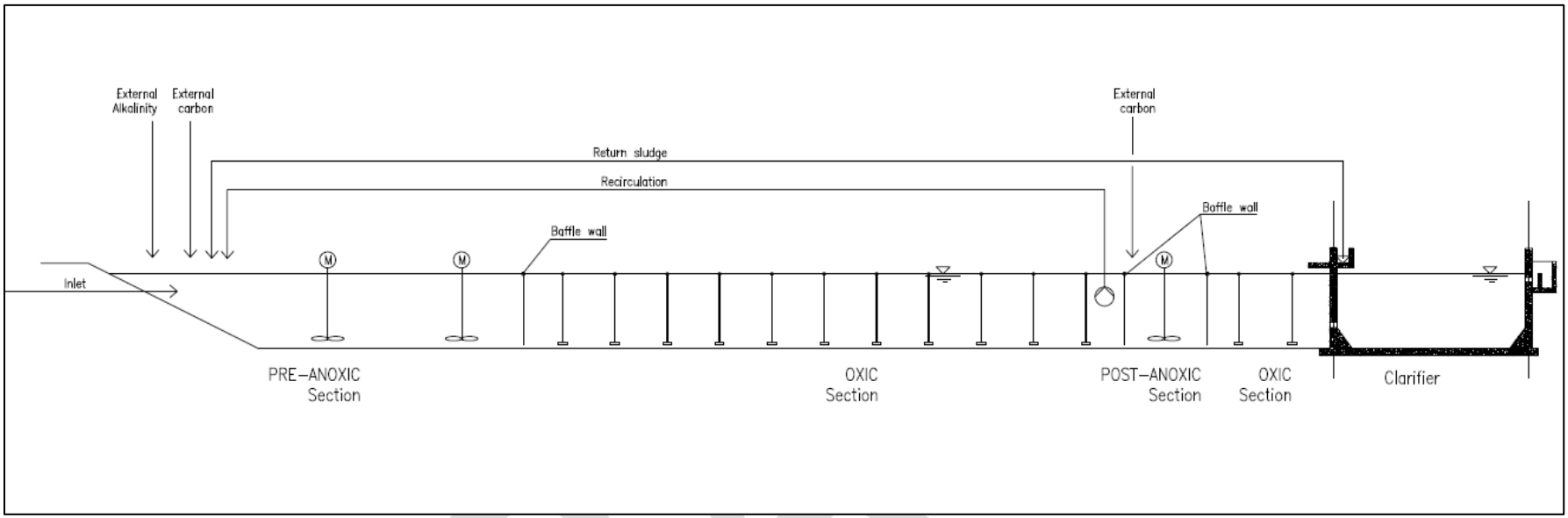

Figure 5.1: Phase 2 Process Flow Mechanical Wastewater Treatment

It is intended that the bulk of the effluent will be used for irrigation, except during rain events. One other option that might be possible depending on the amount of irrigation land available and length of rain events would be to simply build a storage lagoon to hold water during the rain event and then irrigate with it later. A further option that is being explored, is the addition of reed beds.

5.1.1.11 Electricity Supply

The Jamaica Public Service Company Limited (JPS) is committed to improving its system reliability and by extension its service to customers. JPS has proposed an energy solution for Caribbean Broilers Group (CB) at the new Hill Run Facility in St. Catherine. The proposed energy solution is the installation and operation of a 10 MW Dual Fuel Distributed Generation (DG) with Heat Recovery Steam Generators (HRSG) (Figure 5.2).

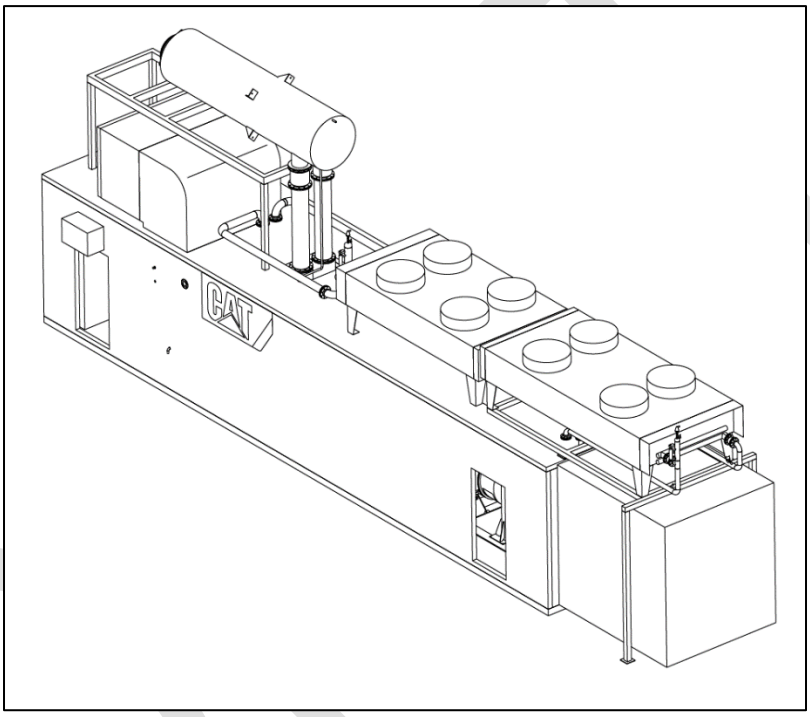

Figure 5.2: Schematic Drawing of the 10 MW Dual Fuel Distributed Generation (DG) with Heat Recovery Steam Generators (HRSG)

The HRSG option will allow for the provision of steam to CB for use in the poultry processing facility. Based on the needs of CB at its expanded facility, JPS' proposed project will entail the following:

- DG-HRSG Facility will be located on CB site under a land lease agreement
- DG-HRSG Facility will be Built, Owned and Operated by JPS
- Installation of 10 MW Natural Gas Fired Distributed Generation with Heat Recovery Steam Generator (DG-HRSG). Highlights of DG-HRSG are as follows:

- Five (5) x 2000 KW natural gas fired internal combustion engine electric power generators on-site.
- Engine cooling will be via a closed-loop glycol-based cooling system
- Generators will be connected to three (3) 440V pad mounted transformers (2x 5MVA and 1x2.5MVA) and associated switch gear to allow for distribution interconnection.
- DG-HRSG will allow for steam production. Feed-water for steam production will be sourced from CB supply and will enter the JPS compound through an underground pipe (diameter 2.54cm). Water will pass through a treatment system before entering the HRSG units. The steam product will be collected from three (3) above ground pipes (7.62cm diameter) and transferred from the JPS fence line to CB via a 15.24cm pipeline.

- The DG-HRSG plant will be grid tied and supply power to grid full-load full-time
- Fuel is Natural Gas (NG) and will be transported to site via ISO tanks by road on a schedule to maintain storage by the NG supplier.
- Bathroom facilities
- Fire Detection & Protection System built into each DG unit and will consist of smoke detectors/switches and a temperature sensor. An external horn for loud auditory warning (108 dB) and flashing lights for visible warning.

The Operation and Maintenance of DG Plant will be responsibility of JPS. They will be supplied water from CB's treated well source. Water will be utilized for sanitation, fire protection and HRSG steam production. The DG-HRSG facility will have a bathroom for the use by JPS operations staff and the sewage & process water discharge will tie into the CB's wastewater treatment plant. The quantity of sewage produced by JPS will be estimated and this information given to CB to incorporate in the final wastewater design.

Since JPS' proposed facility will be Build, Owned and Operated (BOO), JPS will apply for all requisite permits and licences for their proposed facility. JPS will also conduct all necessary Environmental Assessments based on the aspects of their project and the requirements of the Natural Environment and Planning Agency (NEPA). Further, JPS will be consulting with the St. Catherine Municipal Corporation and apply for the requisite permit if applicable.

5.1.1.12 Steam Supply

In addition to the steam requirements outlined in Section 1.3.2.2 above, steam will also be used to give hot water in the poultry processing plant to assist the pickers in taking the feathers off the bird and will also be used at night for sanitation purposes.

Total steam requirements for the compound is approximately 11,000 kg/hr., all for consumption. Steam will be supplied by JPS as indicated in Section 1.3.1.12 above.

5.1.1.13 Liquefied Natural Gas (LNG) Storage and Natural Gas (NG) Distribution Network

Summary of Fuel Supply and Infrastructure

New Fortress Energy (NFE) will deliver liquefied natural gas (LNG) to the JPS 10MW Distributed Generation facility located at the Caribbean Broilers (CB) Hill Run Facility in order to provide the fuel required to operate Electric Power Generation Units. NFE will provide all the infrastructure required to complete the LNG system and the distribution of natural gas (NG) project successfully, including storage tanks and re-gas/processing system (Figure 5.3).

Figure 5.3: Schematic of proposed LNG/NG installation

The main activities under the project are:

1. Site clearance
2. Foundation preparation
    a. Excavation
    b. Steel work/Formwork setup
    c. Concrete pouring and curing
    d. Pipe lying
    e. Pipe testing
3. Installation of equipment
    a. Fabrication of parts outside of Jamaica
    b. Shipment to Jamaica
    c. Transportation of parts from port to site
    d. Assembly on site
    e. Installation

f. Commissioning

4. Operation

Impoundment Area & Bund Wall

NFE will construct an impoundment area and bund wall compliant with United States' National Fire Protection Agency (NFPA) "59(A)", the national guideline for the handling and storage of LNG. The impoundment area will be sized to hold at least 110% of the total volume of a tank, as well as all the liquid piping and components. Rain water and related may be pumped out using a water pump. Under no circumstance will any LNG be allowed to escape this containment.

Storage Tanks

NFE will provide two (2) LNG tanks. These tanks are double-walled construction, with special insulation properties designed to keep the liquid cold. They will be compliant with the American Standards of Mechanical Engineering (ASME) Pressure Vessel code. The storage tanks will be permanently anchored into the foundation, which will be designed, approved & completed by Jamaican professional engineering firms licensed in Jamaica. Tanks will be refilled by delivery of over-the-road tankers (see "Delivery" section below).

The amount of LNG to be stored and sizing of tanks etc. are still to be determined. However, NFE has indicated that based on JPS's requirements they will be storing 5 days of LNG on site. NFE has currently not confirmed whether the tanks will be horizontal or vertical. It has been made clear that tanks will not be smaller than 18,000 gallons in size. NFE will maintain the 50-feet minimum requirement between the vapourizer and the NFE tanks.

Refill Delivery

Portable LNG-transport tanks are used to deliver LNG to the site. Initially, they are filled at New Fortress Energy's Montego Bay facility, then driven to CB Hill Run Chicken processing facility. Once onsite, the delivery tank is connected to the system using a flexible steel hose. NFE plans on trucking LNG from Montego Bay to the Hill Run site 2.4 times a day to deliver the required 19,000 gallons of LNG per day. They estimate 17.8 truck deliveries per week.

Processing System ("Regasification")

Liquid from the storage tanks will be discharged to an LNG Processing System in a controlled and automated manner. There, it will be converted back to its natural state, a gaseous vapor, using vaporizers which will be supplied by NFE. *[In short, LNG is converted back to its natural state simply by allowing it to warm up.]* The Natural Gas itself will be sent to the Power Generation Units, which will consume the natural gas with engines and produce electric power. A computer system will continuously monitor the process conditions of all equipment, flow, and surrounding areas: temperatures, pressures, & flow rates, supply power, etc. All process functions are automatic and controlled by the computer system using a telemetry system. When the engines do not need to consume gas, gas will not flow.

NFE will be applying for all the requisite environmental permits and/or licences as required to fulfil their obligations to supply fuel to the facility.

5.1.2 Phase II

5.1.2.1 Pork and Small Ruminant Processing Plant

With the expansion of CBG's pork operations and Jamaica's love for the meat of other small ruminants such as goat and sheep, this all new processing plant will allow CBG to enhance its current line of pork products and open the doors for it to become involved in the processing of other proteins.

With minimal investment, the company will look to move the current Pork Processing Plant from Lucea to Hill Run by moving pieces of equipment currently used at the Lucea operation to Hill Run. A new Pork Processing Plant will allow CBG to improve its competitiveness as the greater efficiencies to be gained from a newer, larger facility will allow for better pricing to the consumer.

5.2 Justification and Objectives

The main objective of the project is to develop a state of the art facility that is sustainable and able to provide environmentally sound solutions to food production and productivity.

5.2.1 Protein Recovery Plant

The protein recovery plant will provide a sustainable source of raw materials for pet food and for export. The production of such raw materials is envisioned to be environmentally friendly and would serve as an effective means of utilizing waste currently generated by the company's poultry processing plant. The final product of the proposed facility is a feather blood meal which is a protein rich, highly sterile meal produced from hydrolysis, drying and grinding chicken feathers and blood in natural proportions.

5.2.2 New Processing Plant

1. Increased Work Space

By having a custom designed layout, CBG expects to have a Plant that facilitates a much better flow of product and people. The additional space will enable CBG to respond much faster to the needs of the Sales Department with regards to customer orders, reduction and increases to the amount of existing orders, and the ability to produce unique "one off" items for special customers and/or events. Research shows that 40% of congestion-related issues stem from inadequate physical capacity. By having a custom layout and the introduction of basic technology such as conveyors, CBG will be able to reduce head count, and allow faster movement of product from product floor to freezers thereby improving product quality.

2. Improved Health and Environmental Conditions

The new processing plant will be purpose built. It will be designed to prevent cross contamination, efficiently discharge waste, reduce chemical usage and reuse water. The new plant will facilitate designated workstations for health inspectors, which will allow them to carry out their job more efficiently.

The new CBG Campus will be strategically built in a location that minimizes the environmental challenges associated with operating within the Corporate Area. Some of the environmental benefits include reduced organic solid waste, as wastes will be recovered in the Protein Recovery Plant; reuse of treated wastewater for external sanitation activities and irrigation; and improved air quality and odour control from the use of modern processing technology.

6 DESCRIPTION OF THE ENVIRONMENT

This section presents the existing physical ecological and socioeconomic setting in which the development is taking place. Sections 4.1 to 4.9 elaborate. This section is followed by the identification of potential impacts and mitigation measures in Section 5.

6.1 Physical Environment

6.1.1 Topography

Hill Run is a part of the southern St. Catherine plain where elevations across the greater area extend from a high of 21 m at the north of the project site, through 16 m at the outlet of the Town Gully from the farm area, to a low of 10 m at the intersection of the Town Gully and the Hill Run road. The only elevated areas are the hills south of Hill Run and outside the boundary of the areas under consideration. Across the project site the elevation does not vary more than 1 m and can be considered almost flat but with a very gentle downward slope towards the east and south. This will be of importance to the design of drainage from the site as the available slope is very limited.

The location of the project site in the Hill Run area is on flat agricultural land. According to the 1964 Development Order for St. Catherine, the area is zoned for Agriculture and Forest reserves.

6.1.2 Geology and Soils

Soil type and characteristics provide an important control on the hydrological regime of any catchment as soil type directly influences the rate of infiltration/percolation of rainfall into the subsurface.

The geological substructure is a continuation of the Liguanea formation which extends from Kingston as the younger alluvium and changes to the older alluvium just west of Bernard Lodge, extending through the project area as the Older Alluvium to the west of the project area. This Older Alluvium is in the Upper Coastal Group from the Plio-Pleistocene (Figure 6.1). The Liguanea Formation Plio-Pleistocene comprises alternating layers of clayey grits, sands and silts and uncomfortably overlies the rocks of the White Limestone Group.

The Agricultural Soil Classification of Jamaica which was developed by the Rural Physical Planning Unit, now the Agricultural Land Management Division (Ministry of Agriculture) was used to determine and evaluate the types of soil in the project area. These soils are part of the old alluvium and are classified as clay. Field observations confirm that they are clay soils but consistent with soils appropriate for agricultural crops. Soil type in the area was revealed from drain excavations on the farm, ploughed farm soil and the embankments of the Town Gully. The observed soil type is consistent with the classification,

and in the smaller drains beside the farm road and small irregular depressions in the fields some ponding of water was observed, further indicating a low percolation rate.

There are two areas within 2 kms of the site that have sandy loam, one due south in the March Pen area which is smaller than the project site in area and a larger east of the site in the Hartland's area approximately twice the size of the project site. The soil type changes in the area east of the site and closer to Bernard Lodge and is a generally sandy loam in that area.

Due to the topography of the site and the clay soil type as illustrated in Figure 6.2 the site and surrounding area is often affected by flooding during heavy rainfall events.

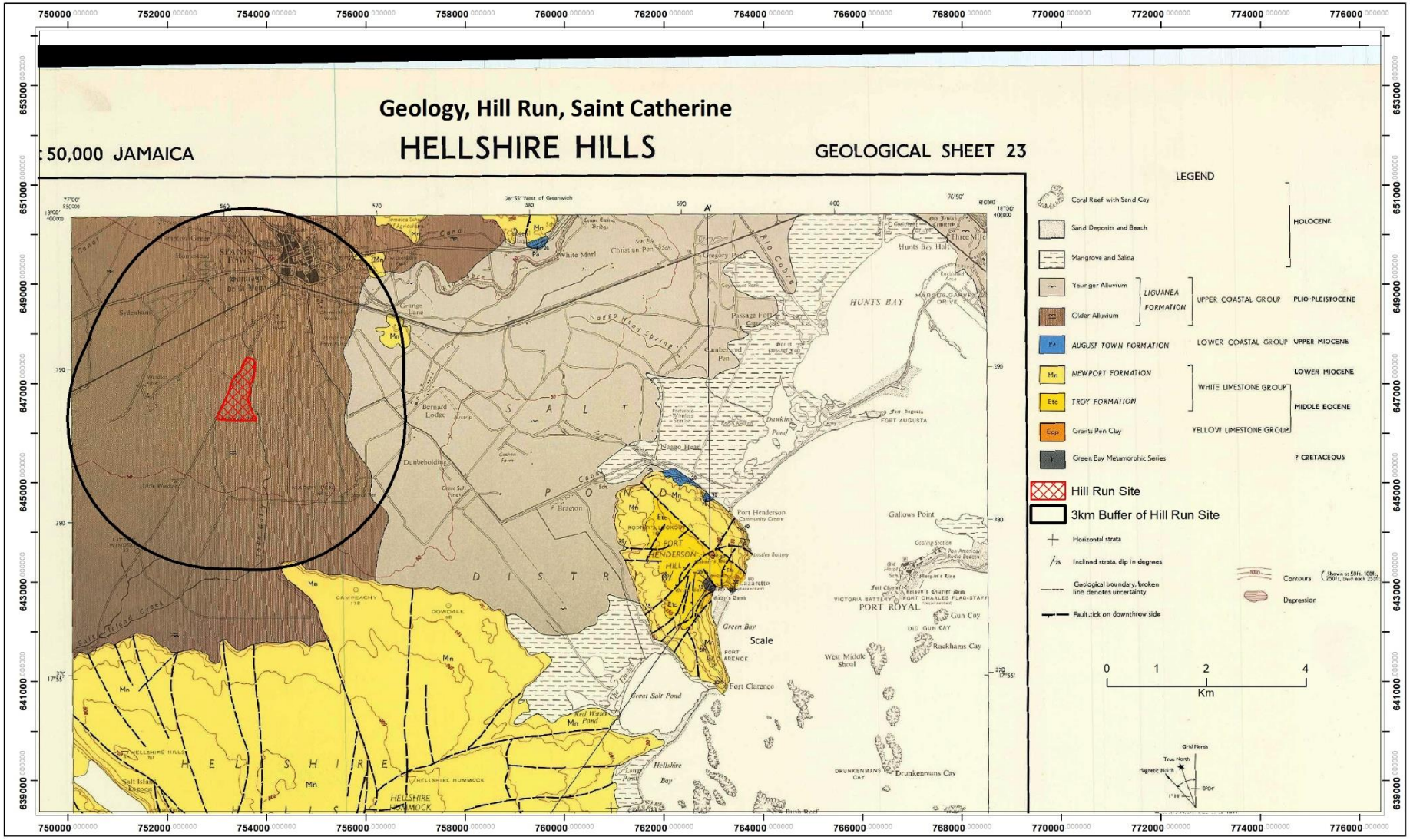

Figure 6.1: Geology of the Hill Run Site Location (outlined in red). Map prepared by WRA

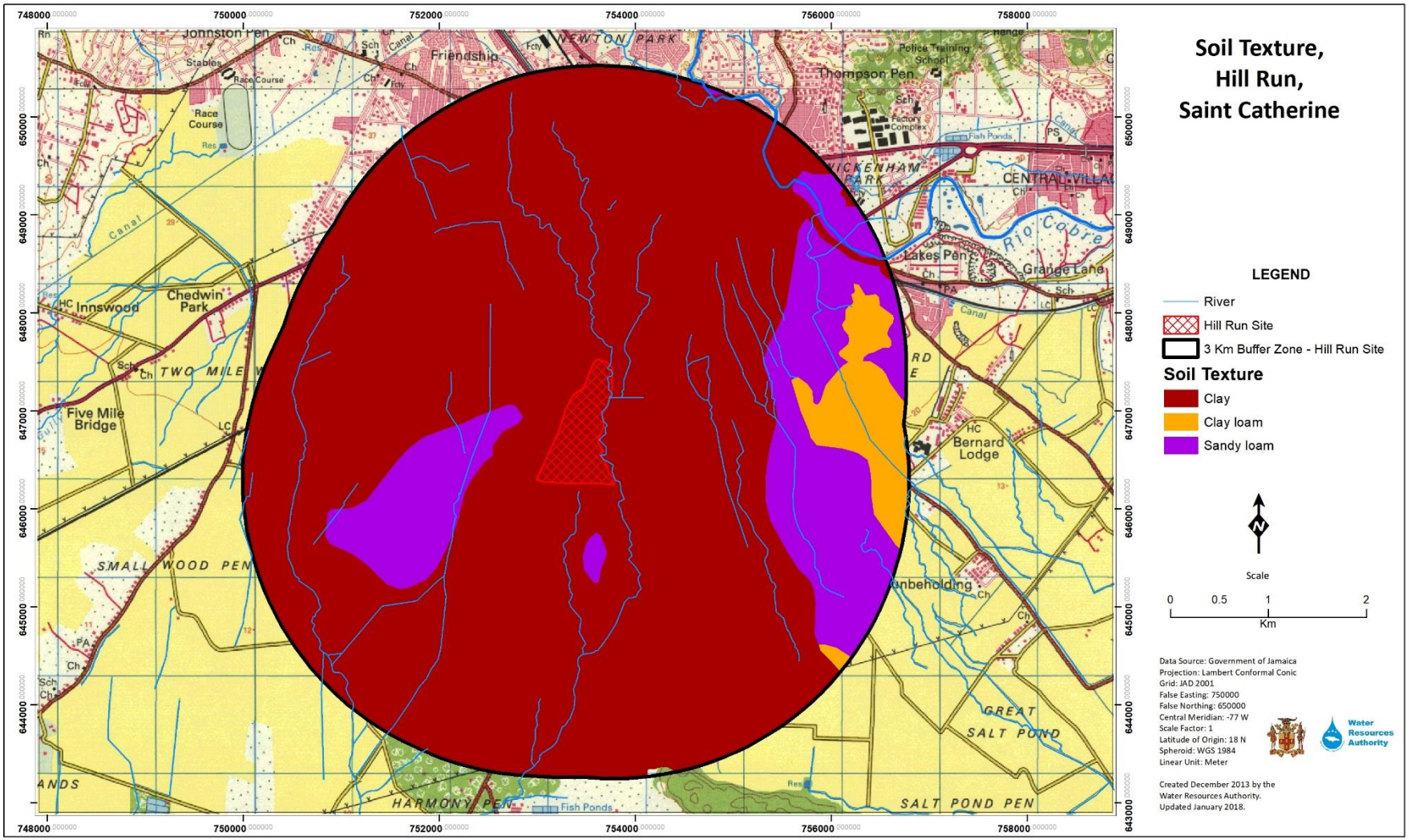

Figure 6.2: Soil Texture of the Hill Run Site Location (outlined in red). Map prepared by WRA

6.1.2.1 Seismic Risk

The geology of the island also given an indication of the seismic risk related to the site. The island of Jamaica which is located within the Caribbean plate boundary zone has experienced many years of earthquake activity with at least 339 years of reliable documentation of felt earthquake.

The source area for earthquakes of significant magnitude may be divided into two groups the pre- and post-Woodford, 1993 earthquake. The location of earthquakes of significant magnitude has special bearing on the expectation of liquefaction-induced ground failure in Jamaica. There is a causal link with magnitude and distance of source from the area experiencing liquefaction.

Historical evidence show that earthquakes of a particular magnitude can have serious implications with regards to liquefaction and ground acceleration for the Liguanea - St Catherine Plains. The location of 1993 earthquake of magnitude 5.5 with intensity of VII inland at Woodford, Portland indicates that earthquake of significant magnitude can be generated inland (Wiggin-Grandison, 1994). The location of the Woodford earthquake in close proximity to these alluvial plains also means that the amplification of the earthquake in the alluvium will be greater than one generated at the Bartlett Trough.

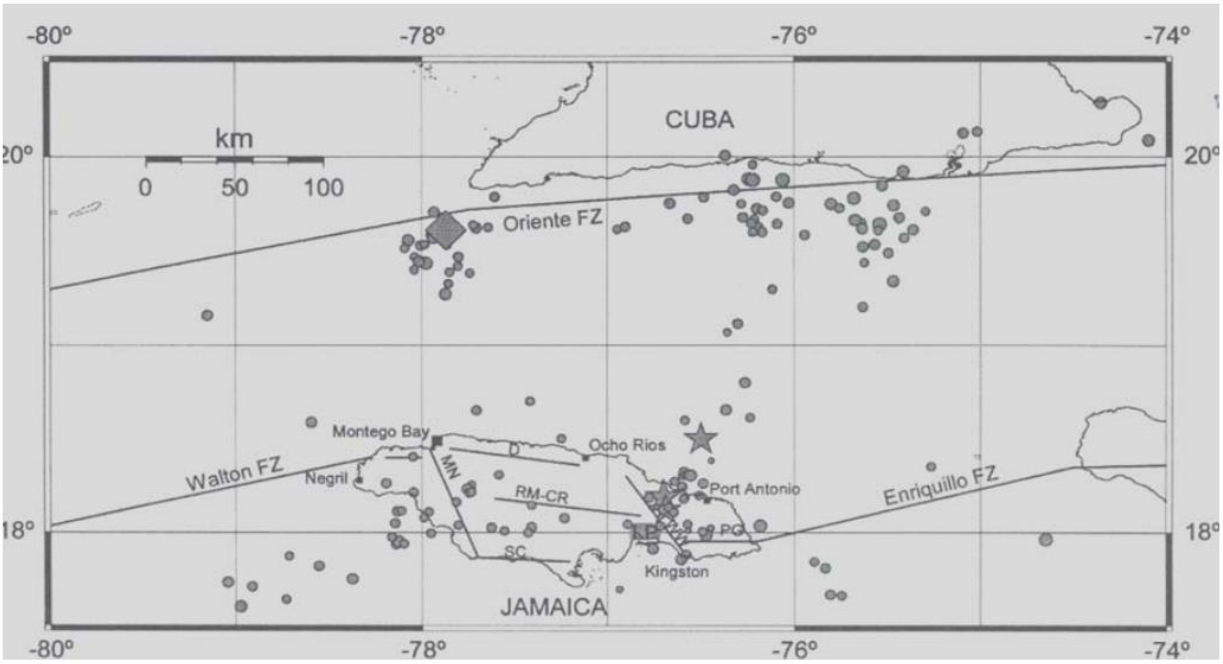

Figure 6.3: Geological Setting and Seismicity (M≥3.0) around Jamaica (LP) Liguanea Plain; FZ fracture/ fault zone; MN= Montpelier-Newmarket; D= Duanvale: RM-CR= Rio Minho-Crawle River, SC= South Coast: WW= Wagwater, PG= Plantain Garden, diameter of epicentres is scaled to Magnitude

Shepherd (1971) indicated that structures, 1- 3 storeys high, situated on the Liguanea Plain are affected significantly by earthquakes of magnitude 6 and over.

6.1.3 Climate

The climate of the general St. Catherine area, like the rest of Jamaica, is subtropical with gentle to moderate north easterly prevailing winds and average daily temperatures varying from 23°C in January to

about 28°C in July. Humidity ranges from 66% to 87% with a significant diurnal variation resulting in high morning humidity dropping off significantly in the afternoon.

The island typically has bimodal rainfall with an initial peak in May and a later peak in October. The drier period is December to March where the long-term average rarely exceeds 100 mm. The long term (1951-1980) mean monthly parish rainfall for St. Catherine is 119 mm. Mean totals range between a low of 50 mm and a high of 238 mm.

Based on the location of the site, it has one long wet period with two distinctive rainfall peaks (May and October). During these rainfall peaks soil moisture content is high and consequently runoff is also high due to antecedent conditions. Closer to the Town Gully and in other parts of the nearby Hill Run community saturated soil conditions remain for extended periods of time, increasing in size with the high rainfall periods in May and October.

During the period June to November each year extreme weather conditions can be influenced by tropical systems that develop in the North Atlantic and Caribbean Basins. These systems are typically tropical storms and hurricanes that move westwards through the Caribbean region generating intense rainfall of long duration.

Climate change projections for this area indicate a general warming trend seen in the historical data will continue through to the end of the century (Climate Studies Group Mona, 2017). The projections show a decrease in annual rainfall (ibid). With respect to hurricanes, while it is likely that overall global frequency will either decrease or remain essentially unchanged, it is more likely than not that the frequency of the most intense storms will increase substantially in some ocean basins (ibid).

6.1.4 Air Quality and Noise

The particulates of greatest concern to humans are those with internal diameter below 10 microns, generally referred to as respirable particulates. Respirable particulates on undeveloped lands are generally from a combination of natural and anthropogenic sources such as pollen, crashing waves, roadside dust, and smoke from vegetation and wood burning or vegetation clearing. The results of the assessment are given in Table 6.1.1 below.

Table 6.1.1: Results of the Air Quality and Noise Assessments

Sample Site	Particulate Matter Concentration (μgm^{-3}) for 24-hour period	NRCA Particulate Matter Concentration (μgm^{-3}) for 24-hour Period	Noise Measurements (dBa)	NRCA Noise Guideline (dBa)
Flag pole on Project Site (AQ1)	14.8	**150**	58.8	**65**
Cane-fields East of Project Site (AQ2)	1.8		37.7	
Security Guard House on Livestock Farm (AQ3)	1.6		49.6	

Sample Site	Particulate Matter Concentration (μgm^{-3}) for 24-hour period	NRCA Particulate Matter Concentration (μgm^{-3}) for 24-hour Period	Noise Measurements (dBa)	NRCA Noise Guideline (dBa)
Imagination Farms- offices (AQ4)	118		56.3	
AgroChem- Storage Container (AQ5)	<1		45.1	
Open lands West of project site (AQ6)	9.8		54.9	

The particulate matter concentrations were within the NEPA ambient 24-hour standard at each sampling station. The concentration of PM_{10} measured at the sampling site on Imagination Farms however was significantly higher than the other sampling stations. Based on the observations made during the assessment, the land clearing activities necessary to prepare the lands for cultivation along with the direction of the prevailing winds are most likely the reasons for the elevated particulate matter levels measured. The location of the project site relative to this sampling site suggest that this site will be impacted by fugitive dust during construction of the processing facility especially when the direction of the prevailing winds is towards the farm's office. The absence of tall trees or other tall plants to act as filters will also exacerbate this issue.

The farm's office building may also act as a first receptor for particulate matter thereby reducing the levels impacting the Agrochemical facility. This is primarily due to the location of Imagination Farms relative to both the project site and agrochemical.

The construction site was dry and the area generally windy, the generation of fugitive dust from the site and from vehicular traffic and heavy equipment entering and leaving this construction site will therefore impact this sampling station and the project site.

The conditions of the other sampling site (presence of trees, shrubs etc. and grass covered grounds) and the absence of any known sources of particulate matter are the primary reasons for the low particulate matter concentrations observed. The recent heavy rains and nature of the soil (primarily clay) may also contribute to the low levels measured. It should be noted that if the existing conditions change such as extensive vegetation removal for cultivation, construction of parochial unpaved roads etc., the particulate matter concentrations within the atmosphere is expected to increase.

The use of screens around the project site during the construction phase and frequent wetting of the site will be recommended to reduce the generation and distribution of fugitive dust. Proper landscaping and initial monitoring of the site would also be recommended during the operational phase to ensure particulate matter stays within the recommended guidelines.

Noise Measurements

The noise levels measured were all well within the cited NRCA Noise Guidelines of 65dBA for all the sites tested. The noise levels measured are directly related to the activities on the various sampling sites,

proximity to know noise sources and prevailing wind conditions. The levels measured during this sampling exercise should therefore not be used as true presentative for the diurnal noise levels of the sampling sites. For a true baseline to be established continuous monitoring of the site over a period of time capturing the various activities will have to be done. Currently it seems that the main sources of noise to impact the project site come from the nearby highway and activities on the nearby Imagination Farms. The impact of noise on the project site will therefore vary depending on the volume of traffic activity on the highway, the activities close to the project site and prevailing wind direction. The degree by which the site will be impacted will depend on the length of the time the source is active, the prevailing winds and the location of the noise relative to the project site.

The noise levels generated by the project site especially during construction will affect the persons on and around the project site. The Consultants recommend monitoring of noise levels during the construction phase to established areas where hearing protection is needed to mitigate against any negative impact of the elevated noise levels. The Consultants also recommend using the US Occupational Safety and Health Administration (OSHA) and National Institute for Occupational Safety and Health (NIOSH) protocols for areas, which would require personnel to wear hearing protection. The allotted for activities on the site by the regulatory agency should also be strictly adhered to minimize adverse impacts to neighbours and the environment.

Similarly, to the recommendations for particulate matter, proper landscaping and initial monitoring of the site would also be recommended during the operational phase to ensure noise levels remain within the recommended guidelines or within the established baseline values.

6.1.5 Hydrology and Drainage

The site hydrostratigraphy is designated as an alluvium aquiclude, indicating that the subsurface rocks are incapable of transmitting significant quantities of water. As alluded to earlier in section 4.1.2, this alluvium aquiclude is composed mainly of clay, which is deposited by physical processes on flood plains. As illustrated in Figure 6.4 groundwater flows southwards toward to coast. There are several wells in the area and Caribbean Broilers will be utilizing well water as their water supply source for the project site.

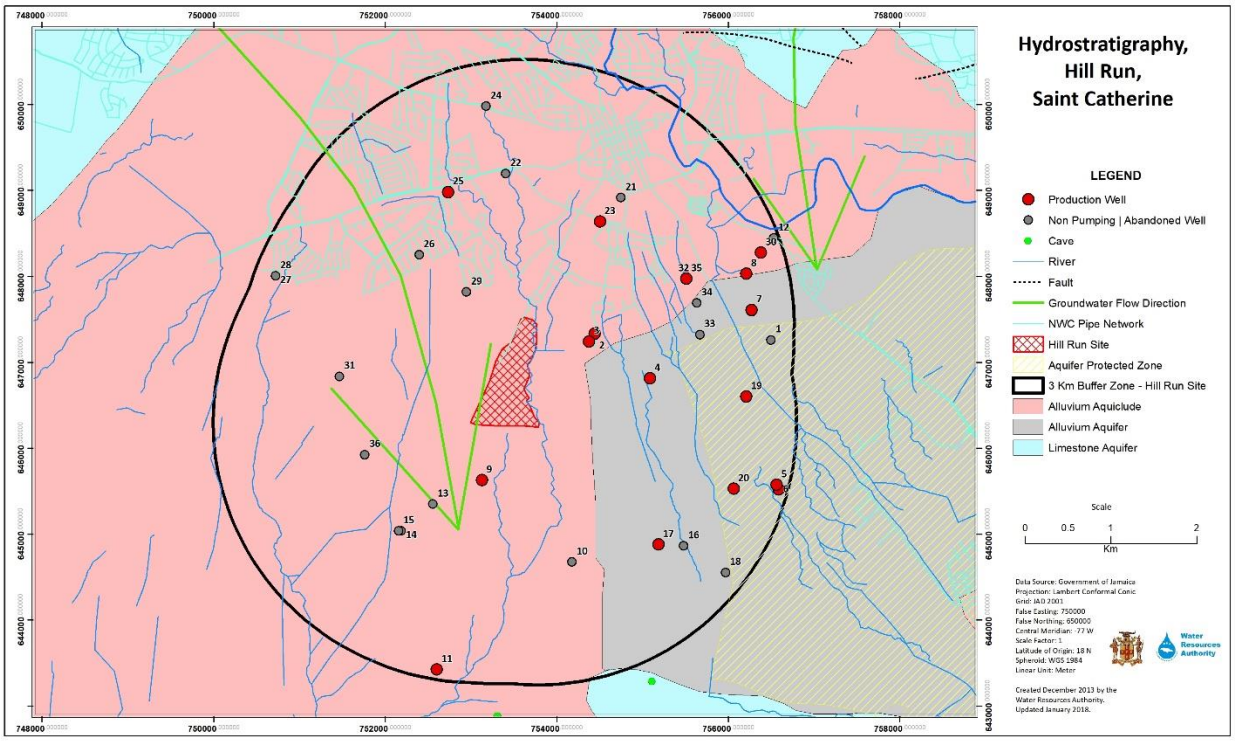

Figure 6.4: Hydro-stratigraphy Map of Project Area

The project area is dominated by the Town Gully, which forms the eastern boundary of the farm and has an extensive drainage area extending north of the site through Spanish Town and to the Homestead area. West of the site, the area is drained by the Salt Island Creek, which eventually joins into the Town Gully but well south of the project area east of the Hill Run community. This combined flow eventually discharges into Salt Island Creek within the Portland Bight Wetland and into Galleon Harbour.

On the existing maps a drain is shown emanating from an area on the farm just south of the proposed factory site, this had been modified previously by the client to form a wide swale that empties into the Town Gully south of the farm and just north of the intersection of the public road at March Pen. This has resulted in the reduction of flooding on the farm from smaller rainfall events that use to create flooding on the farm and on the public access road to the area. This and other work done on drains in the area by the client has resulted in improved drainage for the area, which has been acknowledged by members of the community.

The 30-year mean rainfall for the period 1971 – 2000 is shown in Table 6.1.2 below and the rainfall intensities for the area as derived from the National Works Agency "Guidelines for Developing Hydrologic and Hydraulic Design – revised June 2015" and. used for the evaluation of the runoff are presented in Table 6.1.3. This is an extract from the Jamaica 24 hr. Extreme Rainfall (mm) Isohyetal Map.

Table 6.1.2: The 30-year mean rainfall for the period 1971 – 2000

Location	30 Year Mean Rainfall (mm)											
Bernard Lodge	32	32	42	62	85	71	38	64	124	155	98	39
Dam Head	45	54	60	80	154	89	73	125	158	170	113	49

Table 6.1.3: Rainfall intensities for the area as derived from the National Works Agency

Return Periods	25 Yr.	100 Yr.	Comments
Intensity (mm per 24 Hours)	202.2	252.1	Three selected stations in the project area
	277.0	382.3	
	345.0	554.0	
Average	274.7	396.1	

The peak intensities are 345 mm (25 yr.) and 554 mm (100 yr.).

The discharge from the drainage area through the Town Gully results in flooding and the flood levels are being calculated based on the first principle calculation of the runoff from the watershed, which is determined from the Runoff Coefficients, the Rainfall Intensity and the area of the watershed. The coefficient for the paved areas is 0.4 – 0.5 and for the scrub areas 0.2 as there is more natural percolation in these areas.

The effect of the runoff at 25 years and 100-year return periods is to be evaluated.

Drainage Area

Utilizing the 1:50,000 maps and Google Earth imagery the drainage area for the Town Gully was seen to extend as far north as the Homestead area but only drains the area west of the road to the Bog Walk Gorge. The bypass road itself forms a buffer and the water to the east is discharged elsewhere to the east. The total estimated drainage area is 5 km^2 with a mixture of urban areas with paved roads and some undeveloped areas with scrub lands and vegetation. (Figure 6.5).

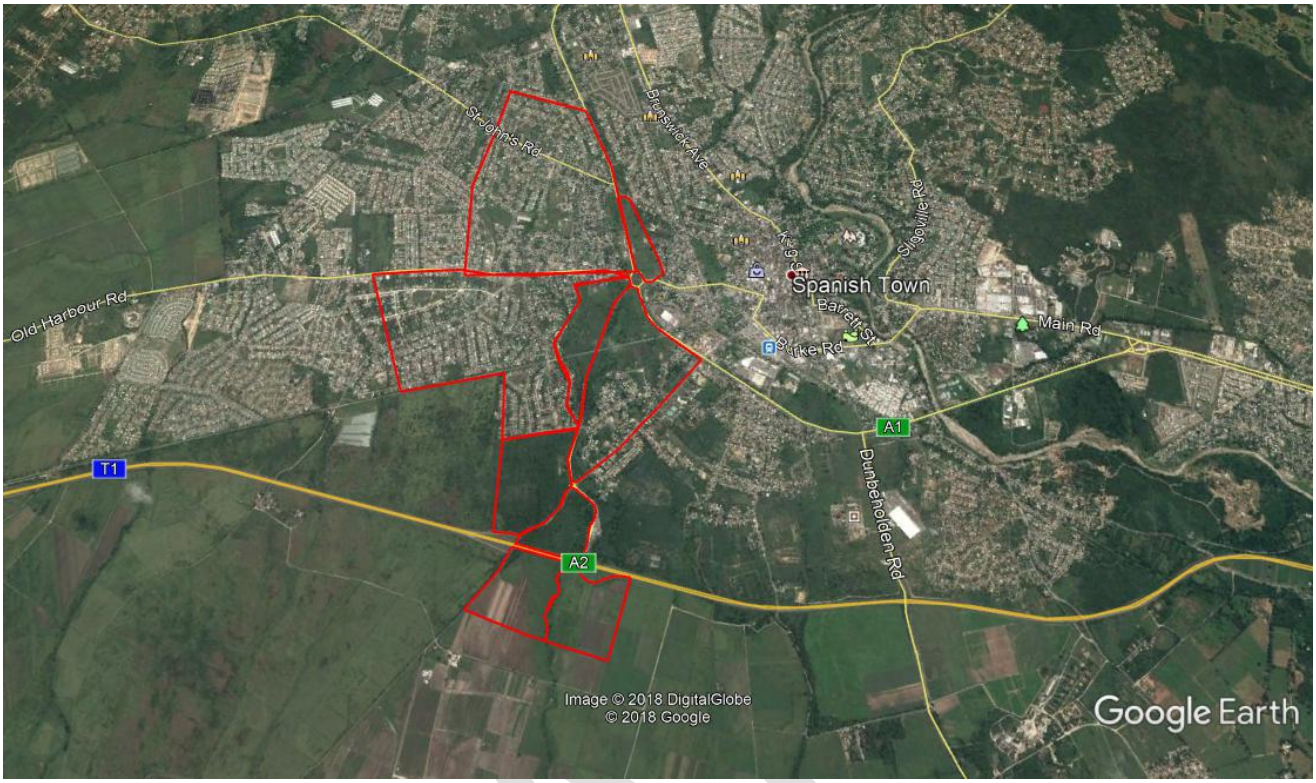

Figure 6.5: Drainage Area of the Town Gully

The areas to the north east of the Old Harbour road and south of St. John's Road consist primarily of housing developments with single and semi- detached housing units and paved roads. There is a small section of similar development north of St. Johns Road.

South of the Old Harbour Road and north of the trainline is similarly developed as described above, however, south of the train line is an undeveloped area with scrub vegetation, old agricultural lands and some fish ponds.

The area between the Salt Island Road and the access road between the Highway and the Old Harbour Road round-a-bout is mixed with developed areas and scrub as above.

The area south of the highway and immediately adjacent to the plant site consists of cleared agricultural lands.

As described in the section on topography the area is flat and slopes in the various drains and natural drainage features are consequently also flat.

The topography of the drainage area is therefore consistent but the development and therefore the runoff coefficients are varied.

One other consideration is flows crossing into this drainage area at peak rainfall periods as other drainage features are inundated. This cannot be determined at this level of investigation and the flows are based on the drainage area as well as can be ascribed strictly to the Town Gully. It also important to note that a

section of the Town Gully is used for the transfer of irrigation water and this occur at the intersection of the irrigation canal and the Town Gully near to the toll booth round-a-bout. During peak flows when the Rio Cobre is in spate and the canal is at high flows, the volume of transfer is an unknown quantity and therefore affects the ability of this assessment to determine the complete flow in the town gully in peak flows.

The calculated flows of 305 m3/s for the 25-year Return Period and 451 m3/s for the 100-year Return Period demonstrate that the Town Gully can carry the flows but where the restrictions occur and there are trees and debris in the channel then overflows occur (Figure 6.6). This is evident just downstream of where the Town Gully passes the proposed site. It is important to note, however, that correcting the problem at Imagination Farms will transfer the flooding downstream as corrections/increases to the channel flow at that location will keep all the flow in the channel until meets another restriction downstream of a section of the Town Gully that is smaller.

Figure 6.6: Earthen Town Gully in Hill Run

Just downstream of the CB site, canals again receive water from the Town Gully but in high rainfall periods those gates will likely be closed, and the full flows will remain in the Town Gully.

The client's Drainage Engineers should look at the flooding potential at the factory location but should also ensure that the client is not passing the risk downstream.

Constructed Drains

Observations on the farm and discussion with personnel familiar with historical flood events have stated that there has been up to 1.2 m of water on the lower section of the farms but only standing or ponding water in the area where the plant is to be located.

6.1.6 Water Quality

The water quality data obtained are given in Table 6.1.4 below.

Table 6.1.4: Water quality data for CB Hill Run samples collected on January 23, 2018

Parameter (units)	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	NRCA Ambient (Fresh) Water Guideline
Nitrate (mg NO_3^-/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 $CaCO_3$/L)	228.4	235.4	244.5	244.8	185.9	118.6	-
Phosphate mg PO_4^{3-}/L)	1.63	2.18	2.12	2.23	1.61	<0.02	**0.01 – 0.8**
Nitrate as Nitrogen (mg NO_3^--N/L)	0.8	<0.3	0.4	0.4	0.6	4.0	-
Ammonia (mg NH_3/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_2/L)	2.3	2.8	2.5	2.8	2.0	1.6	**0.8 – 1.7**
Chemical Oxygen Demand (mg O_2/L)	<3	<3	<3	3	<3	52	-
Turbidity (NTU)	5.08	11.0	8.00	7.02	6.14	3.96	-
Sulphate (mg SO_4^{2-}/L)	23	29	26	27	31	68	**3.0 – 10.0**
Chloride (mg Cl^- /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_2/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	-	-

The Town Gully runs along the eastern boundary of the proposed project site while the National Irrigation Commission (NIC) canal runs along the Western boundary. The Town Gully is unpaved and acts as a receptor for drains and surface run off from roads, industrial and commercial sites for Spanish Town and its environs. The gully eventually merges with two other gullies before it empties into the Portland Bight Protected Area. During the assessment the water collected from the various sampling point appeared clear to cloudy depending on the flow of water and depth at which the sample is taken. Domestic garbage, dead vegetation, tires, and other debris was observed along the banks and into the gully. Aquatic plants and various size fish were also observed in the gully water. The Town Gully is also used as a distribution canal for NIC to supply water to fish farmers in the Lower Hill Run Area. Sampling points WQ1 to WQ5 are taken along the Town Gully.

The NIC canal is a concrete structure which supplies irrigation water to primarily upper Hill Run. The canal originates directly from the Rio Cobre River and is used at times as a receptor for surface runoff for some industrial complex. Small fish and aquatic plants were observed in the waters in this canal. Domestic

garbage was also observed accumulating at the culverts of this distribution system. Sampling point WQ 6 was taken in the NIC canal. Appendix VII presents the discussion of the results for each parameter; a summary is presented in section 4.1.5.1 below.

A resampling exercise was conducted on March 12, 2018 for samplings sites WQ 3 and WQ5 to determine if the quality of water at WQ5 was being influence by unknown source. The data indicated that the quality of water at these two locations were consistent with the quality taken from the other locations along the Town Gully on January 23, 2018. The small variations in the water quality at WQ 5 on January 23rd may therefore have been from nearby surface runoff from the recent rainfall activities.

Table 6.1.5: Comparison of Water quality data for CB Hill Run samples collected on, March 3, 2018- site WQ3

Parameters (units)	Test Method	Results WQ3 (23/01/2018)	Results WQ3 (12/03/2018)	NRCA Ambient Water Quality Standard
Nitrate (mg NO_3^-/L)	H-8039	2.0	4.4	**0.1 – 7.5**
Nitrate as Nitrogen (mg NO_3^--N/L)		0.4	1.0	-
Temperature (°C)	DR	28.0	29.7	-
Salinity (ppt)	DR	0.30	0.34	-
Alkalinity (mg $CaCO_3$/L)	Mod H-8221	244.5	286.64	-
Phosphate (mg PO_4^{3-}/L)	H-8048	2.12	2.06	**0.01 – 0.8**
Total Nitrogen (mg N/L)	H-10071	2.3	5.4	-
Biochemical Oxygen Demand (mg O_2/L)	H-10099	2.5	<0.1	**0.8 – 1.7**
Chemical Oxygen Demand (mg O_2/L)	H-8000	<3	<3	-
Turbidity (NTU)	EPA 180.1	8.00	7.42	-
Sulphate (mg SO_4^{2-}/L)	H-8051	26	27	**3.0 – 10.0**
Chloride (mg Cl^-/L)	H-8206	34.4	236.0	**5.0 – 20.0**
Salmonella (in 400mL)	SM 9260B	Not Detected	Detected	-
Total Coliform (MPN/100ml)	SM-9221	>1600	>1600	-
***E. coli* (MPN/100ml)**	SM-9221	79	220	-
Faecal Coliform (MPN/100ml)	SM-9221	240	>1600	-
Total Suspended Solids (mg/L)	SM-2540D	6.8	8.9	-
pH (pH units)	DR	7.71	7.73	**7.00 – 8.40**
Total Dissolved Solids (mg/L)	DR	409.5	461.50	**120.0 – 300**
Conductivity (mS/cm)	DR	0.67	0.77	**0.15– 0.6**
Dissolved Oxygen (mg O_2/L)	DR	2.78	2.67	-
Fats, Oil and Grease (mg/L)	EPA 1664A	2	<1	-
Calcium (mg Ca/L)	F-AAS	80.6	78.2	**40.0 - 101.0**
Magnesium (mg Mg/L)	F-AAS	12.5	13.2	**3.6 – 27.0**
Potassium (mg K/L)	F-AAS	6.58	5.16	**0.74 – 5.0**
Sodium (mg Na/L)	F-AAS	39.8	36.1	**4.5 – 12.0**
Arsenic (µg As/L)	COL	<10	<10	-

Parameters (units)	Test Method	Results WQ3 (23/01/2018)	Results WQ3 (12/03/2018)	NRCA Ambient Water Quality Standard
Chromium (µg Cr/L)	F-AAS	<20	<20	-
Copper (µg Cu/L)	F-AAS	<10	29	-
Lead (µg Pb/L)	F-AAS	<20	<20	-
Mercury (µg Hg/L)	CV-AAS	<0.2	<20	-
Iron (µg Fe/ L)	F-AAS	171	252	-
Zinc (µg Zn/L)	F-AAS	14	47	-
Ammonia (mg NH_3/L)	Col	1.95	1.39	-

Table 6.1.5: Comparison of Water quality data for CB Hill Run samples collected on, March 3, 2018- site WQ5

Parameters (units)	Test Method	Results WQ5 (23/01/2018)	Results WQ5 (12/03/2018)	NRCA Ambient Water Quality Standard
Nitrate (mg NO_3^-/L)	H-8039	2.8	1.6	**0.1 – 7.5**
Nitrate as Nitrogen (mg NO_3^--N/L)		0.63	0.36	-
Temperature (°C)	DR	28.6	28.7	-
Salinity (ppt)	DR	0.35	0.26	-
Alkalinity (mg $CaCO_3$/L)	Mod H-8221	185.9	259.13	-
Phosphate (mg PO_4^{3-}/L)	H-8048	1.61	1.75	**0.01 – 0.8**
Total Nitrogen (mg N/L)	H-10071	2.0	2.6	-
Biochemical Oxygen Demand (mg O_2/L)	H-10099	2.0	<0.1	**0.8 – 1.7**
Chemical Oxygen Demand (mg O_2/L)	H-8000	<3	<3	-
Turbidity (NTU)	EPA 180.1	6.14	5.71	-
Sulphate (mg SO_4^{2-}/L)	H-8051	31	16	**3.0 – 10.0**
Chloride (mg Cl^-/L)	H-8206	132.2	113.6	**5.0 – 20.0**
Salmonella (in 400mL)	SM 9260B	Detected	Detected	-
Total Coliform (MPN/100ml)	SM-9221	>1600	1600	-
***E. coli* (MPN/100ml)**	SM-9221	350	22	-
Faecal Coliform (MPN/100ml)	SM-9221	350	130	-
Total Suspended Solids (mg/L)	SM-2540D	4.2	5.0	-
pH (pH units)	DR	8.09	7.66	**7.00 – 8.40**
Total Dissolved Solids (mg/L)	DR	630.50	357.50	**120.0 – 300**
Conductivity (mS/cm)	DR	1.04	0.59	**0.15– 0.6**
Dissolved Oxygen (mg O_2/L)	DR	4.75	1.95	-
Fats, Oil and Grease (mg/L)	EPA 1664A	<1	<1	-
Calcium (mg Ca/L)	F-AAS	84.5	88.3	**40.0 - 101.0**
Magnesium (mg Mg/L)	F-AAS	13.9	13.8	**3.6 – 27.0**
Potassium (mg K/L)	F-AAS	8.83	6.97	**0.74 – 5.0**

Parameters (units)	Test Method	Results WQ5 (23/01/2018)	Results WQ5 (12/03/2018)	NRCA Ambient Water Quality Standard
Sodium (mg Na/L)	F-AAS	90.4	53.3	**4.5 – 12.0**
Arsenic (µg As/L)	COL	<10	<10	-
Chromium (µg Cr/L)	F-AAS	<20	<20	-
Copper (µg Cu/L)	F-AAS	<10	18	-
Lead (µg Pb/L)	F-AAS	<20	<20	-
Mercury (µg Hg/L)	CV-AAS	<0.2	<0.2	-
Iron (µg Fe/ L)	F-AAS	22	52	-
Zinc (µg Zn/L)	F-AAS	21	12	-
Ammonia (mg NH_3/L)	Col	<0.02	<0.02	-

6.1.6.1 Summary

The water quality data obtained from the present investigation indicates that both the Town Gully and NIC canal water quality is 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 shown Table 6.1.4 above. It is suspected that the NIC canal is also influenced by industrial and/or commercial discharge.

The water quality data point south of the site (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. This has potential negative impacts on persons using the water for farming and aquaculture downstream. CBG has indicated that they are committed to ensuring that the effluent from their waste water treatment plant exceeds the NRCA standards for effluent quality.

There are also clear anthropogenic effects as solid waste was observed all along the banks of the Town Gully. Continued monitoring on these systems are recommended given their importance to the agricultural practices at that locale and to ensure further deterioration of water quality is prevented during the construction and operational phases of the proposed project.

6.2 Biological Environment

The historical use of the site as an agricultural site, as far back as 2001 from Google Earth Imagery, has rendered the ecological significance of the specific project site to be minimal. Aside from the agricultural crops, namely corn, pepper, onion, sorrel and cotton, the vegetation on the site was limited to specific areas.

The desktop review identified three (3) main areas of vegetation on the site, with the poultry plant footprint included as a fourth. (Figure 6.7). The ecologically significant areas total 139,478m^2, or 34.5 acres.

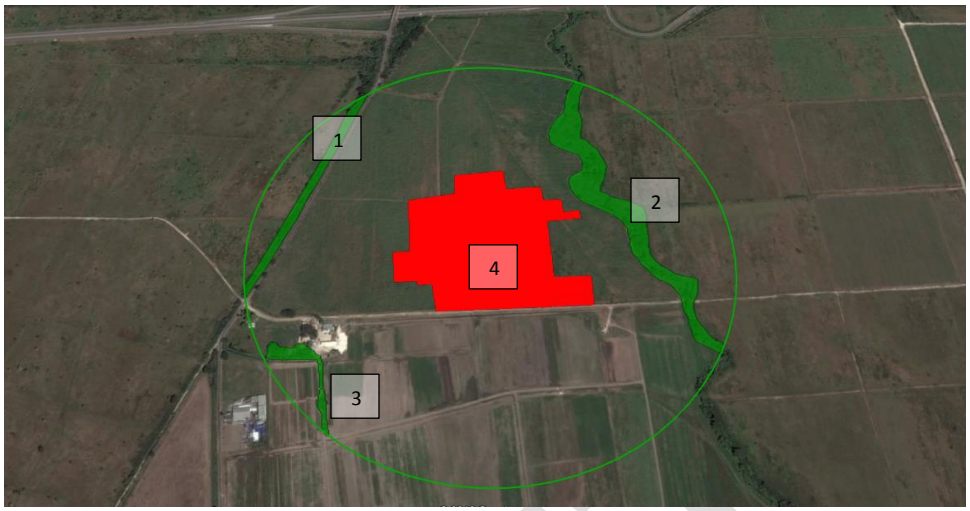

Figure 6.7: Image showing areas outside within 500m of the project site (red) deemed to be ecologically significant (green)

1. Along the Town Gully to the East of the Site (10,018m^2/2.48 acres)
2. Along the Irrigation Canal to the West of the Site (33,294 m^2/9.23 acres)
3. Around the existing CB Facility to the South of the Site (4,138m^2/1.0 acres)
4. Within the Poultry plant footprint (92,028m^2/22.7 acres)

6.2.1 Flora

The existing environment can be described as mainly ruinate agricultural lands, with pockets of ecological diversity. The ruinate agricultural land (See Figure 6.8) dominates the project site and facility footprint with mainly shrubs and saplings below three (3) meters in height. Mature trees observed on site were mainly fruit trees surrounding the existing CB facility, in addition to Guango (*Samanea saman*) and *Eugenia sp.* There were no areas of ecological significance within the footprint of the project or within the agricultural plots.

Figure 6.8: (left) View of project site from the access road towards the North-West. (right) View of project site from the access road towards the North East. In the background are vegetated areas 1 & 2 respectively from Figure 6.7

Agricultural species being cultivated within the agricultural lots consist of: Corn (*Zea mays*), Sweet Pepper (*Capsicum annuum*), Onion (*Allium cepa*), Sorrel (*Rumex acetosa*) and Cotton (*Gossypium sp*.). There are plans to incorporate Pumpkin (*Cucurbita sp.*) and Coconut (*Cocos nucifera*) in the near future.

Figure 6.9: (left) Town Gully with overhanging vegetation. (right) Shoreline vegetation along the Town Gully.

Areas 1 & 2 from Figure 6.7 were found to be similar environments therefore it was not surprising that they bore ecological similarities to each other. They, also being the larger areas of investigation outside of the footprint of the poultry plant, would likely contain the majority of the biodiversity observed on this site. Appendix VIII shows the species observed on the project site and their relative abundances.

Although one (1) endemic species was observed to be on site (but not in development footprint) (*Hylocereus Triangularis*), the overall flora identification and abundance assessment exercise did not produce results that would classify the area as being ecological significant. As expected, the ecological diversity was concentrated in areas 1 and 2 in Figure 6.7. The project footprint was significantly devoid of ecological significance and contributed very little to the assessment of the site.

6.2.2 Fauna

Fauna observed during the ecological assessment were not out of the ordinary for a site with a history of agricultural use over many years. A flock of Egrets (*Ardea alba*) was seen feeding on soil dwelling invertebrates in the agricultural lots (Figure 6.10). An Osprey (Pandion haliaetus) was observed eating a lizard atop a tall tree. The lizard could not be identified from such a distance; however, other species of lizard were observed, namely *Anolis grahami.* Small insects observed included Bees (*Apis mellifera*) and Zebra Butterfly (*Heliconius charitonius*).

Ecological diversity was generally low with few sightings of most organisms observed. Through discussion with CB personnel, it was stated that a particularly troublesome agricultural pest had been threatening the crops. The pest was identified as the Beet armyworm (*Spodoptera exigua*). To manage the pest, CB has had to utilize pheromone traps at the ends of planting lines to attract the insect away from the crops. This has been effective thus far.

Figure 6.10: (left) Egrets (Ardea alba) were observed feeding within the agricultural plots of land. (right)Planting lines and pheromone traps for the Beet armyworm (Spodoptera exigua)

The species identified in the assessment were consistent with a site with current and historical agricultural usage. Many small insects and very few large organisms are typical of the site, although there have been reports that there has been crocodile (*Crocodylus acutus*) sightings in the area due to the proximity of the waterways: The Irrigation Canal to the West and the Town Gully to the East. There were however no sightings of this organism during the site investigation. A table of the species lists observed is included Appendix VIII.

No endemic species were observed during the assessment that would allow for classification of this site as ecologically significant. The site does not house any organisms that would warrant specific further investigations. The reports of sightings of crocodiles in the area is a noted and should be taken into consideration when planning safety and security measures.

6.3 Socio-economic Environment

6.3.1 Setting

The Hill Run Community which is a small district within Cromarty, St. Catherine. Cromarty is divided into five (5) smaller districts; Cromarty Proper, March Pen/ Corletts Road, Hill Run, Duncan's Pen and Windsor Road. The area generally comprises a large farming district with activities including fish farming downstream of the project site, livestock rearing and cane farming. Within Cromarty are several schools, churches, community centres, community parks, multipurpose court facilities and playfields.

The project site is located South of the Toll Road, adjacent to Imagination Farms and North of DaCosta Farms (Figure 6.11).

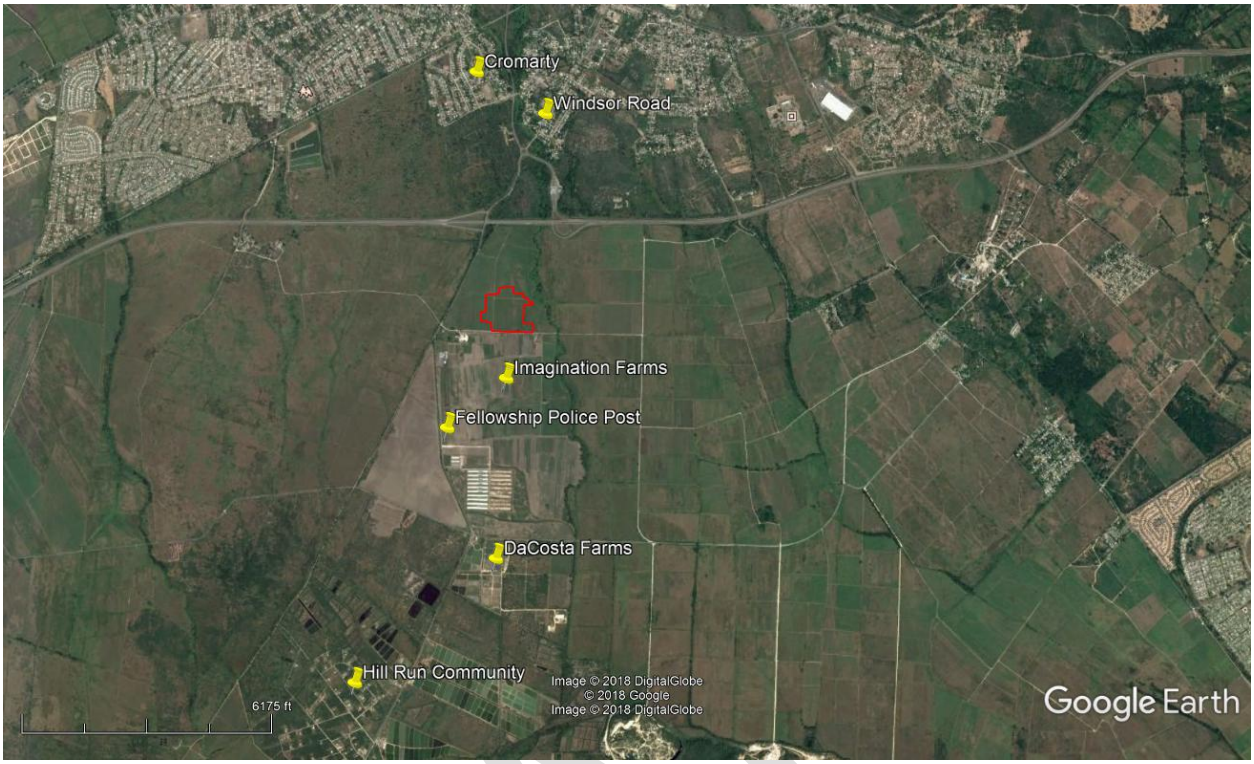

Figure 6.11: Project Location and the surrounding communities

The 2011 STATIN data showed the population size of the area based on a best fit of the Enumeration Districts (EDs) is approximately 3,841 in size. This best fit includes 4 of the 5 communities listed above, which are closest to the development (Hill Run, Cromarty proper, Duncan's Pen and Windsor Road). Most of the persons in the area work outside of the community as teachers, nurses, tradesmen, police men and labourers. Few people farm within the community.

STATIN Census suggests that the community has been growing. The population is relatively young with 54% under the age of 30 and only 8% over the age of 65 (STATIN Census, 2011). The average family size has been reported as being approximately 4 persons per household (SDC, 2014).

The 2011 Census data indicates that based on the best fit EDs, there are 1,172 housing units and 97% of these are separate detached houses; 65% of which are made of block and steel and 26% made of wood (Figure 6.12). Figure 6.13 below illustrates sample houses in the community.

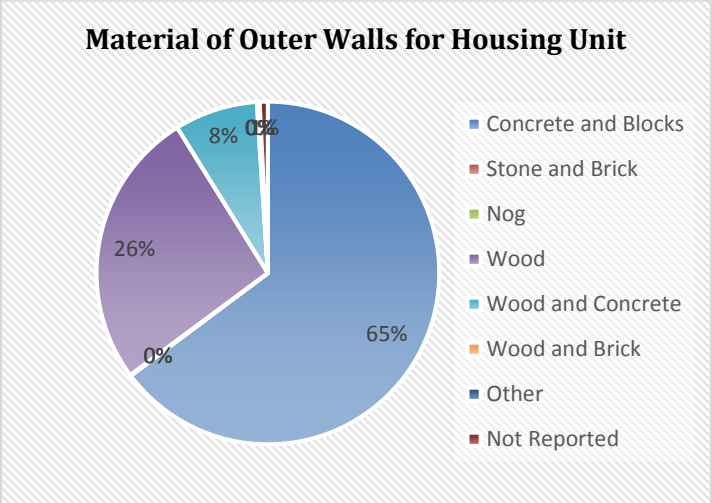

Figure 6.12: Material of Outer Walls for Households

Figure 6.13: Sample of Housing Stock (Top: Hill Run proper; Bottom: Cromarty Grove)

6.3.2 Land Use Patterns of the Site and Surrounding Areas

The general area is zoned for Agriculture and Forest reserves. The site itself was used for sugar cane cultivation in the past. Imagination Farms which is a part of the CB Group is adjacent to the property and 5 crops are grown there - corn, sorrel, cotton, sweet pepper and onion. CB also has several chicken houses to the south as well 2 to 3 pig houses.

DaCosta Farms now operates a family attraction which offers fishing, paintball, a children's play area, restaurant and bar.

Figure 6.14: Imagination Farms

Figure 6.15: Dacosta Farms

Much of the fish ponds and other agricultural land in the Hill Run Community are not being used. Theft has resulted in the closure of several fish farms, leaving substantial overgrown farms/ fish farms. There are only three small shops in the Hill Run Community.

6.3.3 Description of existing infrastructure

The following sub-sections describe the status of existing infrastructure that serves the Hill Run Area.

6.3.3.1 Traffic and Transportation

The community largely relies on taxis as their main source of transportation. Very few people own their own vehicles. The roads are in terrible condition due to poor drainage in the area (Figure 6.16).

Figure 6.16: Flooded Road in Hill Run

6.3.3.2 Electricity

The area is supplied with electricity from JPS. The 2011 census data suggests that 95% of all households use electricity as their source of lighting. An additional plant is expected to be built by JPS on the project site to supply the project with the required electricity.

6.3.3.3 Water

The residential community receives their water from the National Water Commission. They have indicated the supply has improved in recent years. The 2011 census data suggests that 87% of households have access to NWC water piped into their yard/dwelling. The farming community receives their water from the NIC canal. It has been reported that some of the farmers also take their water from the Town Gully.

The National Irrigation Commission's (NIC) canal runs to the west of the property boundary to supply water to their customers in the area. A small section (100 feet) of this canal will have to be excavated by the developers to accommodate their proposed entrance. Discussion with NIC have yielded that there is no objection to the development but based on their plans to expand their coverage and upgrade their infrastructure, they request that CBG install a 4" pipeline as a replacement, since their vision is to do so for this area. This will prevent future disturbance by NIC to correct that section of the canal.

6.3.3.4 Wastewater/ Sewage Management

It is reported that all residents have some form of sanitary convenience. Most homes have soakaway pits for discharging their sewage or wastewater. None of the homes are connected to a formal sewage system. The 2011 census reports that 60% of persons private water closets and 15% use private pits, the remainder uses shared facilities.

6.3.3.5 Waste Disposal

Solid waste is collected by the National Solid Waste Management Authority (NSWMA) at least once per month. It is reported that sometimes they come twice per month. People tend to burn in between when the trucks from NSWMA come to their community. The 2011 census results show that 44% of residents utilize the garbage collection system and 44% burn their garbage (Figure 6.17).

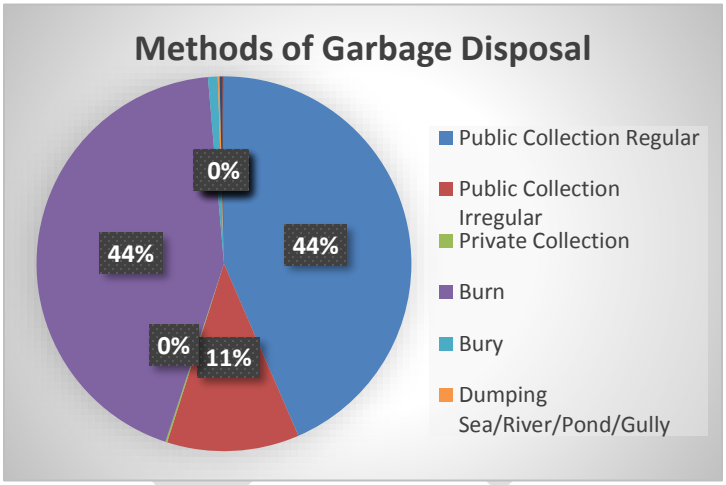

Figure 6.17: Methods of Garbage Disposal

6.3.3.6 Telecommunications

Jamaica offers a fully automatic domestic telephone network. An opening up of the telecommunications market in 1999 resulted in rapid growth in mobile-cellular telephone usage while the number of fixed lines in use has declined; combined fixed-line and mobile cellular tele density exceeds 110 per 100 persons.

The Fibralink submarine cable network provides enhanced delivery of business and broadband traffic and is linked to the Americas Region Caribbean Ring System (ARCOS-1) submarine cable in the Dominican Republic. The link to ARCOS-1 provides seamless connectivity to US, parts of the Caribbean, Central America, and South America; the ALBA-1 fibre-optic submarine cable links Jamaica, Cuba, and Venezuela; satellite earth stations - 2 Intelsat (Atlantic Ocean) (2015).

Most individuals within Hill Run and the wider Cromarty area have at least one personal cellular phone or access to one on the Digicel or Flow network.

6.3.4 Health Services

There are no health services in the Hill Run Community. The closest is the St. Jago Park Health Centre which provides curative, maternal and child health, dental, family planning, mental, child guidance, STI investigations and HIV counselling. St. Catherine has 26 health centres and eight (8) satellite clinics spread across four (4) health zones. The parish is served by two (2) hospitals, Spanish Town a Type B Hospital and Linstead a Type C Hospital, the former is closest to the Hill Run Community.

6.3.5 Fire Services

There are no fire services in the Hill Run Community, the closest is the Spanish Town Fire Station.

6.3.6 Crime and Police Services

The closest Police Station/ Post to the site is the Fellowship Hall Police Post. This post was recently established in in July 2015. Before this, the Hill Run area particularly was reportedly used as a dumping site for bodies because of the amount of unused agricultural land. Since its establishment along with CB's investment in the area, this has significantly reduced. In 2017, there were 8 to 10 reported incidents. The major crimes reported relate to praedial larceny. Fish farmers are often the main victims. There has been one instance with Crocodiles where NEPA had to be called to restrain and remove it from the area.

6.3.7 Other Services

There are no churches, education facilities, or community centres in the Hill Run community. However, within the wider Cromarty district, there are 10 schools, 18 churches, 1 community centre and 5 playfields (See Table 6.3.1 and Figure 6.18 below). The McAuley Primary School is also designated a Shelter by the Office of Disaster Preparedness and Emergency Management.

Table 6.3.1: Services within the Cromarty District (SDC, 2014)

Service/Facility	Names
Schools	1. Cromarty Land Basic 2. Valley Christian Ministry basic 3. Valley Christian Ministry Prep 4. Geneva's Basic School 5. UAr-Rahmam Kindergarten 6. Little Angles Learning Centre 7. Windsor School of Special Education 8. McAuley Primary 9. Wrights Basic School 10. Love and Faith Basic
Churches/Mosque	1. United Holiness Deliverance Church of God 2. Valley Christian Ministry International 3. Gemevas Church 4. Masjid Ar-Rahman (Mosque)) 5. Victory Church of God 6. Bibleway Church of God 7. Pentecostal Miracle Deliverance 8. Harmony Gospel Chapel 9. Church of the Nazarene 10. Tree of life Pentecostal 11. March Pen Pentecostal 12. World Vision Church of God 13. Mount Sianal Healing Temple 14. St Luke Christ Church 15. Corletts Road SDA 16. Church of Jesus Christ 17. St James Trinitarian 18. True Gospel Guide
Community Centres	1. March Pen/ Corletts Road Community Centre

Service/Facility	Names
Playfields	1. March Pen/ Corletts Road playing Field 2. March Pen/ Corletts Road Multipurpose Court 3. Chang's Park 4. Windsor Avenue Football Field 5. Windsor Avenue Netball Court

Figure 6.18: Some Services within the Cromarty District (Top left: Gemeva Basic School; Top right: McAuley Primary School; Bottom left: Bibleway Church of God; Bottom right: Windsor School of Special Education)

6.3.8 Heritage

Archaeological and historical records indicate that the project site has historically been used for sugar-cane production was a part of the Turners Pen and Fellowship Hall Lands, which dates back to the 1700s.

No heritage features were noted on site or within the surrounding area. The historical district of Spanish Town that was originally built by the Spanish after Sevilla Nueva (New Seville) dates from 1534 but is not within 2km of the project site. Heritage features outside of this area are not considered critical due to distance and impacts are not likely based on the nature of the development.

7 PUBLIC PARTICIPATION

7.1.1 Overall Public Perception

The stakeholders were first consulted as small groups, and these persons generally accepted the project. They reported that CB has made improvements to the Hill Run Community in the form of roads and drainage works. This has alleviated some amount of flooding but has not eliminated the problem. They expressed that the only major issues they have is with the occasional smell when passing the chicken houses.

Residents of Hill Run proper, which is south of the site, have complained of significant flooding in the area, Images in Section 4.3.1 above shows flooded roads. Residents of Duncan's Pen, which is north of the site, have complained of flooding at the southernmost end of the Salt Island Road in the community with overflow from the Town Gully.

The most common concerns expressed by those consulted in the group meetings included:

- **Wastewater**- They did not want any discharge of waste water into the drains/ Town Gully as they know it is used by some farmers for irrigation or use in their fish ponds.
- **Odour-** Very few expressed concerns about whether the project would generate unpleasant odours which may affect their community.

The most common perceived benefits expressed by those consulted in the small groups included:

- **Drainage Improvement**- person expressed their hope for CB to maintain the main drains and to create additional drains to accommodate the run off from the roads as a part of their Corporate Social Responsibility.
- **Road Improvement**- the internal road network in both Hill Run and Cromarty needs improvement due to heavy ponding of water whenever it rains. Drainage needs to be improved for ponding to be eliminated. Residents expressed their hope for CB to assist with this as they undertake their project.
- **Community Centre (Hill Run)-** The Hill Run Community has already expressed their desire to build a community centre with assistance from CB. They are hoping that CB will undertake this as part of their CSR.
- **Employment-** A few people were hopeful that the project would provide employment for members within the community and not just during the construction period.

In addition to the community group meetings held, a survey was also completed to gather responses on the project. Community members were provided with a project brief outlining the activities of CB, JPS and NFE, prior to issuing the questionnaire. A total for 219 respondents were received from person in Hill Run, Duncan's Pen, Windsor Road and Cromarty. The summary responses are elaborated below.

Community Approval of Project

Of the total respondents, 97% either highly approve or approve of the project and 98% consider the project necessary or very necessary (Figure 7.1). In both cases approximately 3% of persons interviewed did not approve of the project and thought it was unnecessary because they felt that they didn't have enough information about the project and wanted the client to meet with the community directly.

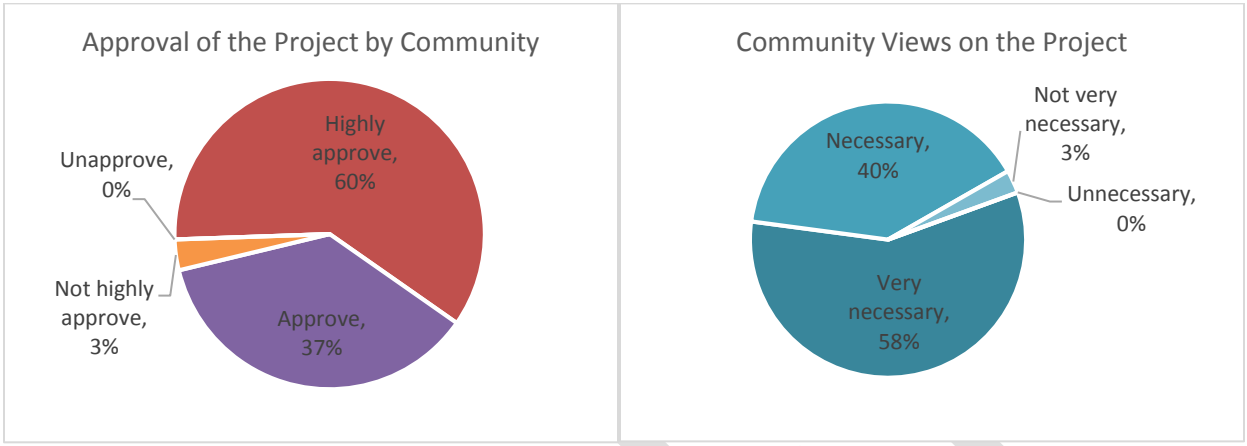

Figure 7.1: Approval of Project by the Community (left); Community Views on the Project (right)

Fears/reservations

The community members interviewed were asked to identify any specific fears or reservations that they had about the project. The responses yielded that about 44% of persons expressed no fears, but of those that did gas leakages and pollution were the two (2) most prevalent issues expressed (Figure 7.2).

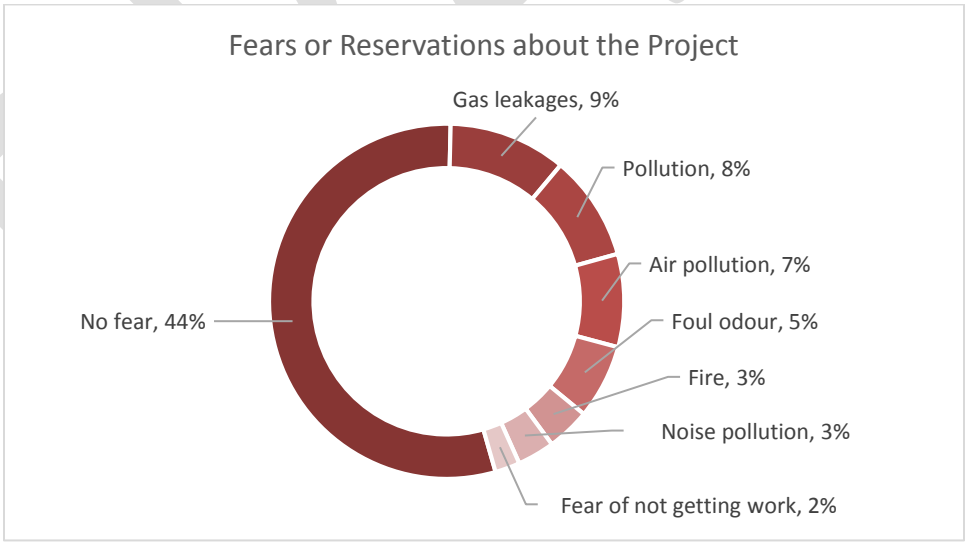

Figure 7.2: Fears or Reservations about the Project

Main benefits

Community members were also asked to identify any benefits they saw from the overall project development in the area. Of the responses, 60% was employment as the main benefit (Figure 7.3). Roads, street lights and community development projects were some of the other common responses.

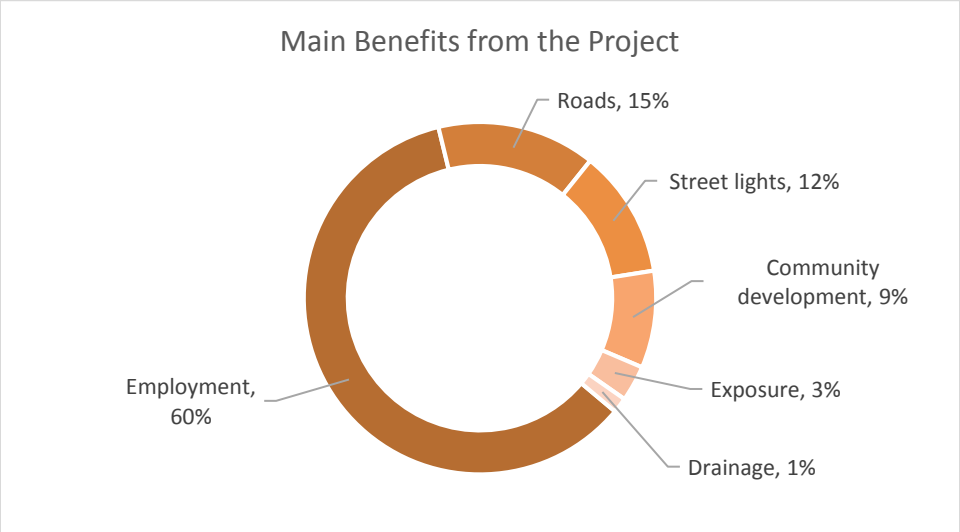

Figure 7.3: Main Benefits from the Project

Environmental concerns

Community members were also asked to indicate any environmental concerns they had related to the proposed development. Of the responses received, 46% of persons were concerned about pollution in general, 23% were concerned about air pollution and 9% were concerned about noise (Figure 7.4). Other answers included gas explosion, chemicals, radiation, odour, waste management issues and the risk of fires.

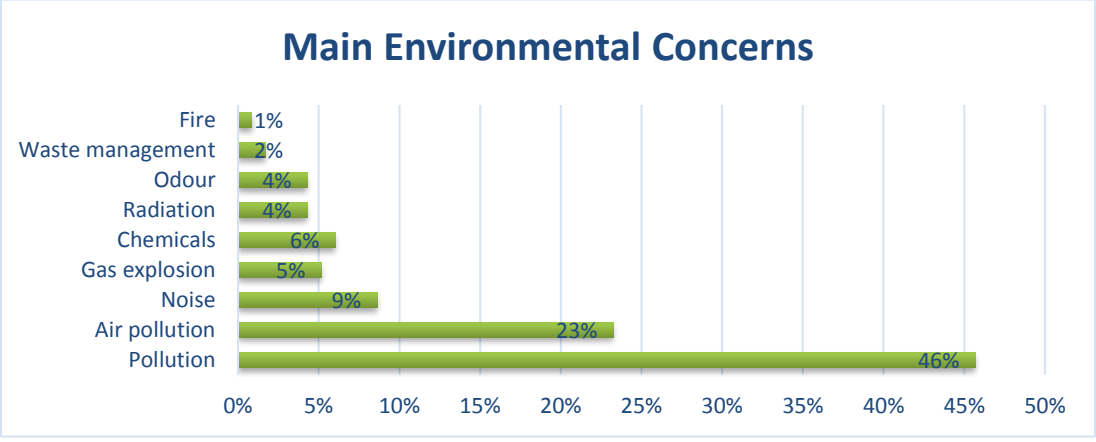

Figure 7.4: Main Environmental Concerns

Alternative land uses

When asked about alternative uses for the land, no suggestions made by any of the community members.

What the Community can offer the Project

89% of the community members interviewed felt that the community could offer workers to the project.

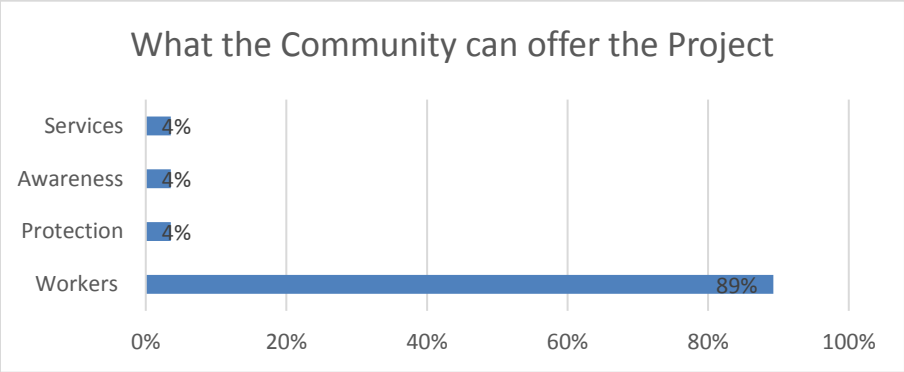

Figure 7.5:What the Community can offer the Project

7.1.2 Public perception by Community

7.1.2.1 Hill Run

Hill Run Proper Approval of Project

Of the total 92 respondents in Hill Run, 92% either highly approve or approve of the project and 93% consider the project necessary or very necessary (Figure 7.6). In both cases approximately 7-8% of persons interviewed did not highly approve of the project and thought it was unnecessary because they felt that they didn't have enough information about the project and wanted the client to meet with them directly.

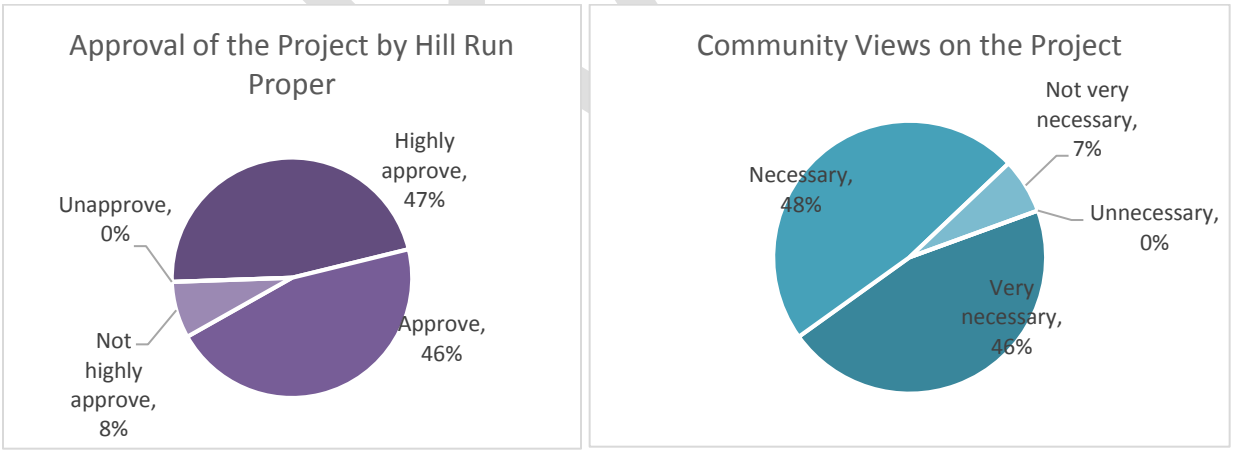

Figure 7.6: Approval of Project by Hill Run Proper (left); Community Views on the Project (right)

Fears/reservations

Of the 92 persons interviewed in Hill Run, 51 persons responded that they had any specific fears or reservations about the project. The responses yielded that about 44.5% of persons expressed no fears, but of those that did, gas leakages and pollution were the two (2) most prevalent issues expressed (Figure 7.7).

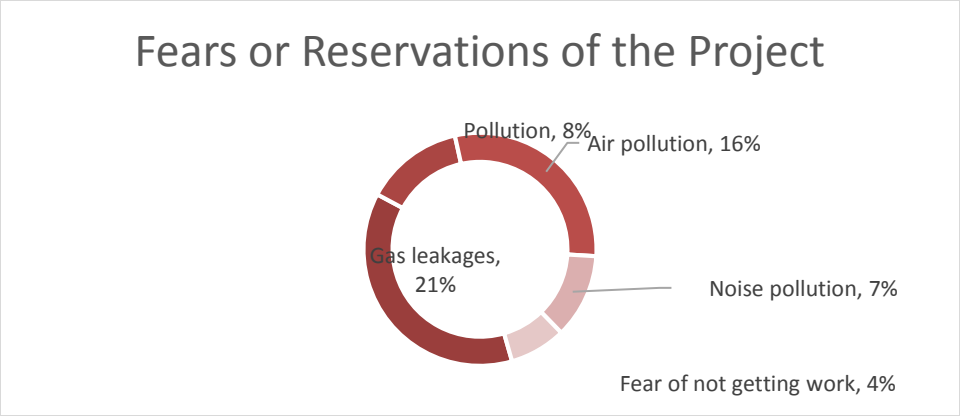

Figure 7.7: Fears or Reservations about the Project

Main benefits

Members of Hill Run were also asked to identify any benefits they saw from the overall project development in the area. Of the responses, 39% saw road development as the main benefit (Figure 7.8). Street lights, employment and drainage improvements to the area were some of the other common responses.

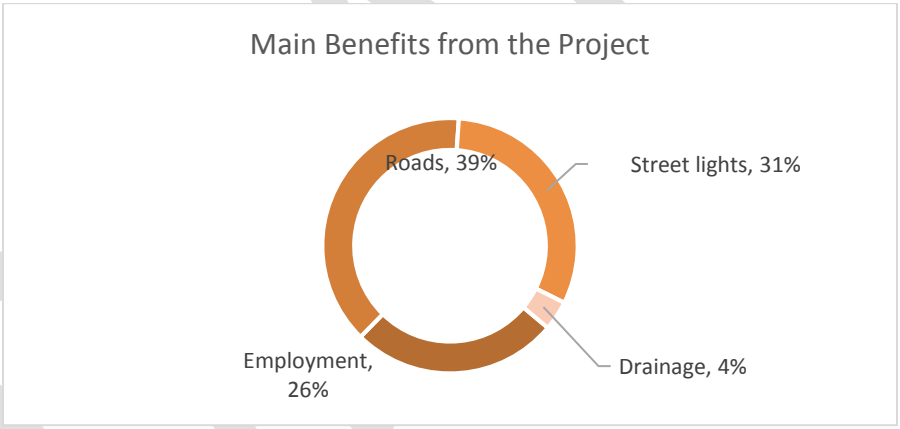

Figure 7.8: Main Benefits from the Project

Environmental concerns

Person from Hill Run were also asked to indicate any environmental concerns they had related to the proposed development. Of the responses received, 42% of persons were concerned about pollution in general, 26% were concerned about air pollution and 9% were concerned about noise (Figure 7.4). Other answers included gas explosion, chemicals, radiation and odour.

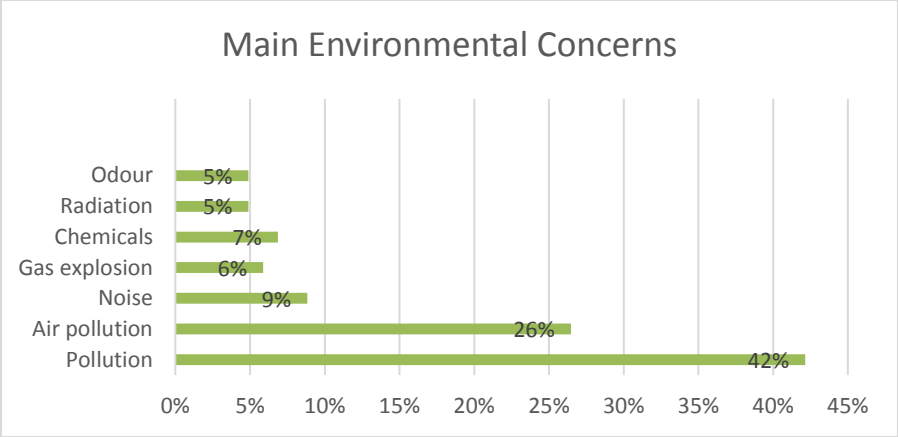

Figure 7.9: Main Environmental Concerns

Alternative land uses

When asked about alternative uses for the land, no suggestions made by any of the Hill Run community members.

What Hill Run can offer the Project

85% of the community members interviewed felt that the community could offer workers to the project (Figure 7.10).

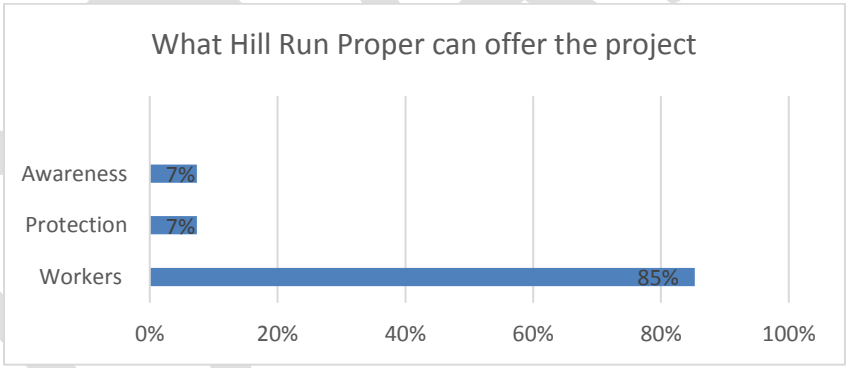

Figure 7.10:What the Community can offer the Project

7.1.2.2 Duncan's Pen

Of the total 38 respondents from the Duncan's Pen community, 100% either highly approved or approved of the project, and viewed the project as very necessary or necessary (Figure 7.11).

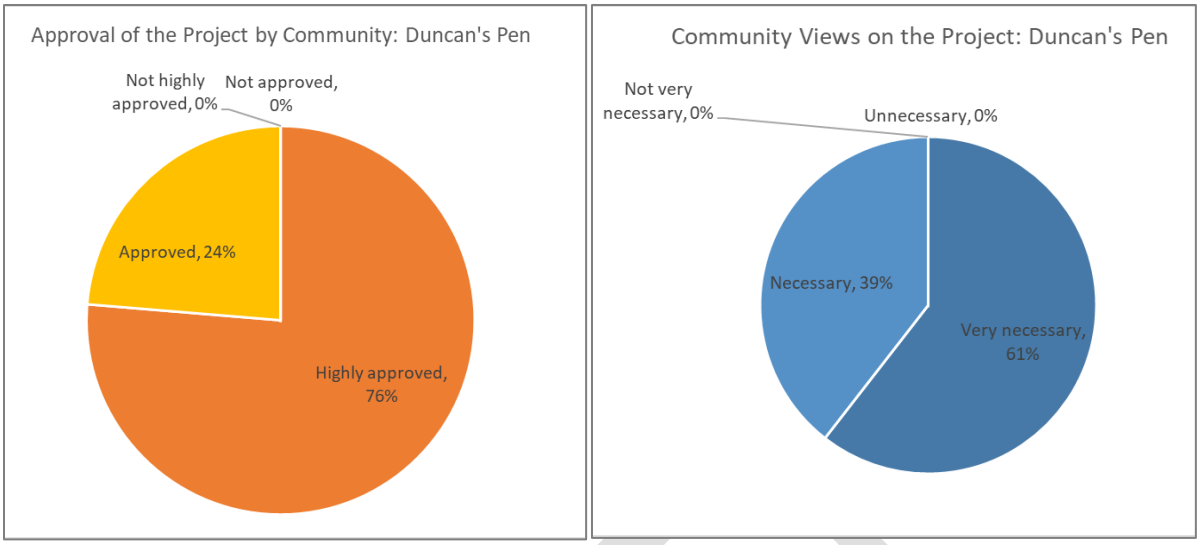

Figure 7.11: Approval of Project by the Duncan's Pen Community (top); Community Views on the Project (bottom)

Fears/reservations

The community members interviewed from Duncan's Pen were asked to identify any specific fears or reservations that they had about the project. The responses yielded that about 92% of persons expressed no fears, but of those that did, pollution and foul odour were the two (2) issues identified (Figure 7.12).

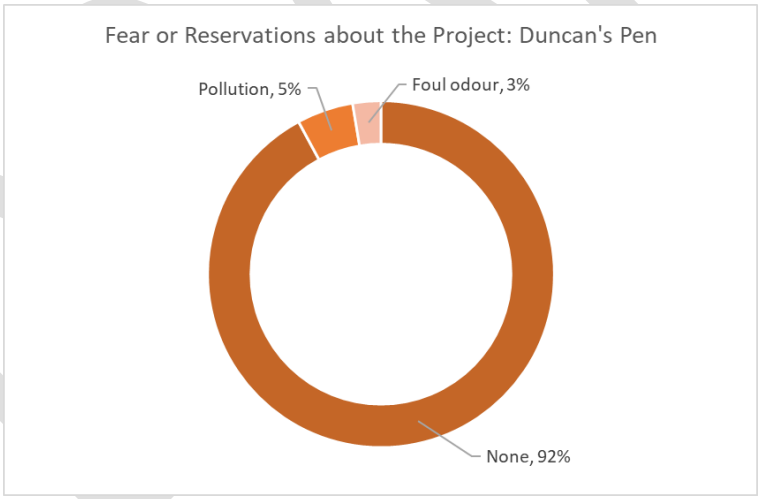

Figure 7.12: Fears or Reservations about the Project: Duncan's Pen

Main benefits

Community members of Duncan's Pen were also asked to identify any benefits they saw from the overall project development in the area. Of the responses, 73% was employment as the main benefit, followed by community development with 23% (Figure 7.13).

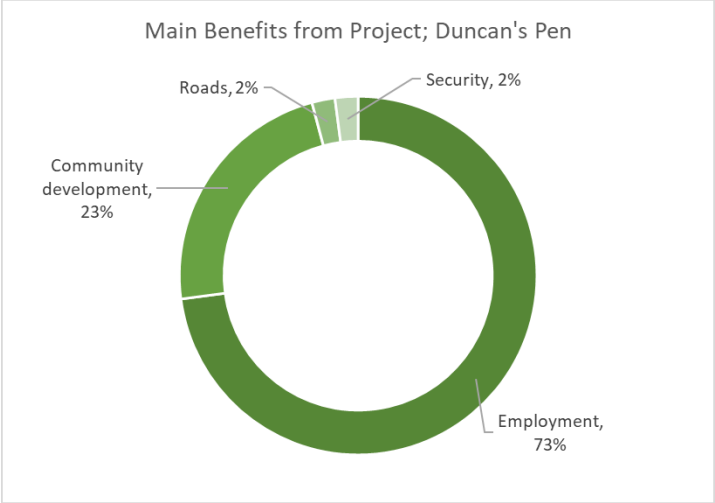

Figure 7.13: Main Benefits from the Project: Duncan's Pen

Environmental concerns

Community members of Duncan's Pen were also asked to indicate any environmental concerns they had related to the proposed development. Of the responses received, 79% of persons had no concerns, 8% were concerned about pollution, and 8% were concerned about air pollution (Figure 7.14). Other answers included odour and waste management.

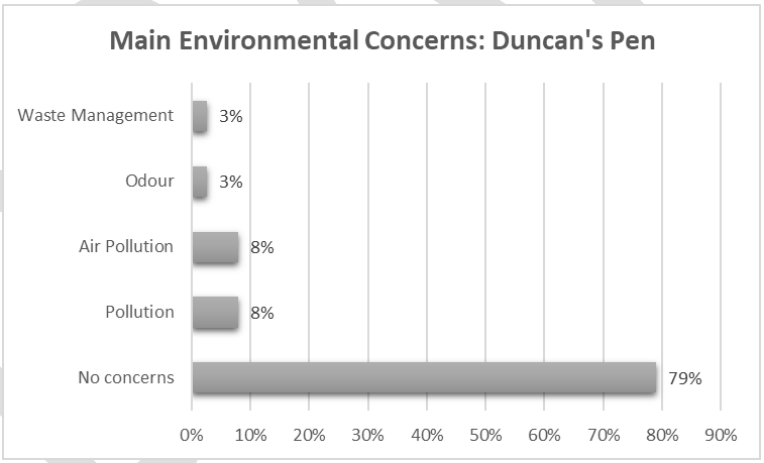

Figure 7.14: Main Environmental Concerns: Duncan's Pen

Alternative land uses

When asked about alternative uses for the land, no suggestions made by any of the community members from Duncan's Pen.

What the Community can offer the Project

65% of the community members of Duncan's Pen interviewed felt that the community could offer workers to the project (Figure 7.15).

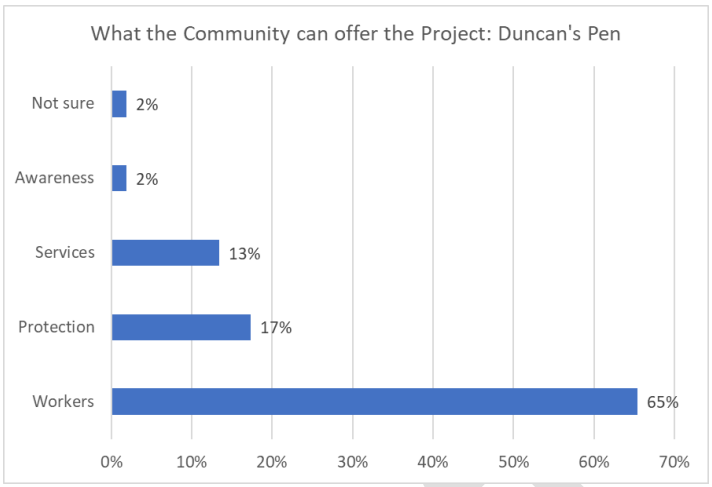

Figure 7.15:What the Community can offer the Project: Duncan's Pen

7.1.2.3 Cromarty Grove

Community Approval of Project

Of the 30 respondents from the Cromarty community, 100% either highly approved or approved of the project, and viewed the project as very necessary or necessary (Figure 7.16).

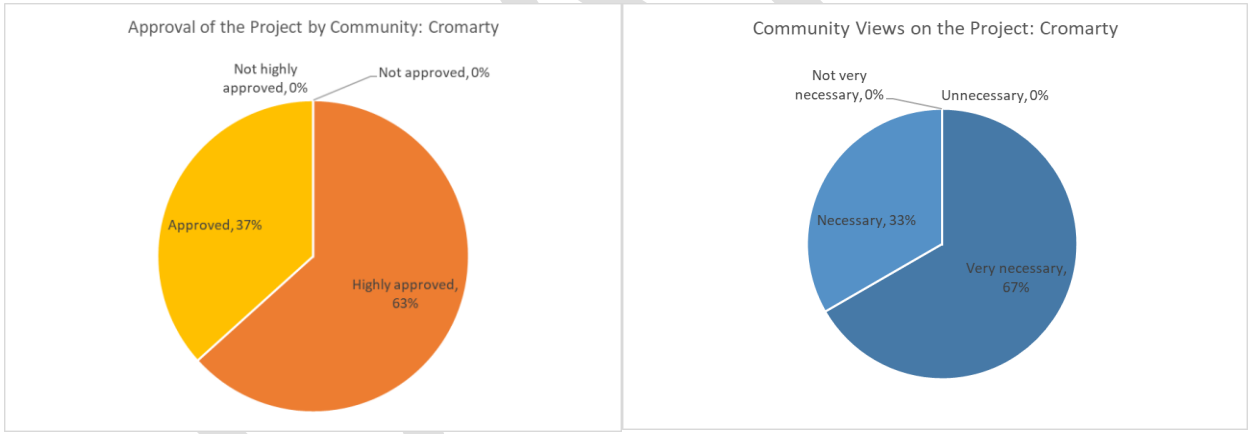

Figure 7.16: Approval of Project by the Cromarty Community (top); Community Views on the Project (bottom)

Fears/reservations

The community members interviewed from Cromarty were asked to identify any specific fears or reservations that they had about the project. The responses yielded that about 53% of persons expressed no fears, but of those that did, the risk of fire, pollution and foul odour were the three (3) issues identified (Figure 7.17).

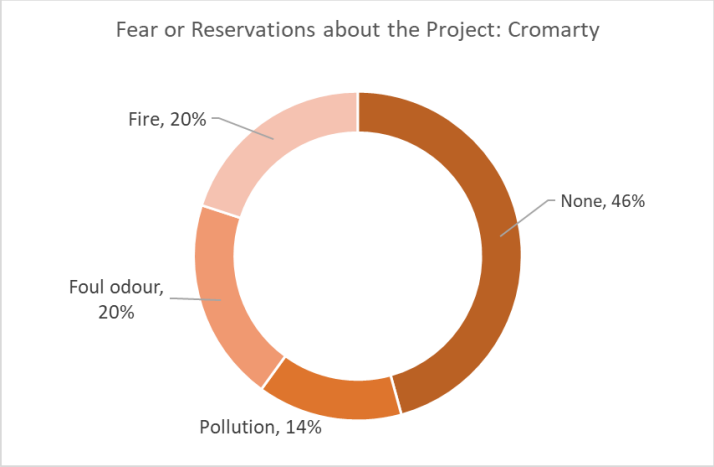

Figure 7.17: Fears or Reservations about the Project: Cromarty

Main benefits

Community members of Cromarty were also asked to identify any benefits they saw from the overall project development in the area. Of the responses, 78% was employment as the main benefit, followed by community development with 19% (Figure 7.18).

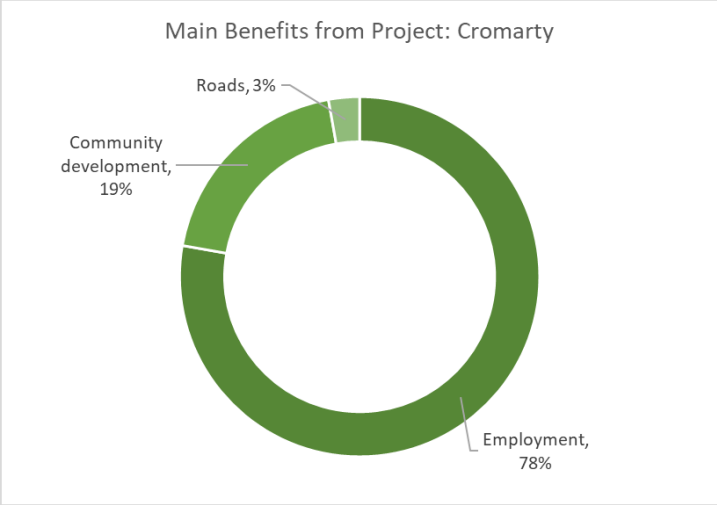

Figure 7.18: Main Benefits from the Project: Cromarty

Environmental concerns

Community members of Cromarty were also asked to indicate any environmental concerns they had related to the proposed development. Of the responses received, 50% of persons had no concerns, 18% were concerned about air pollution, 16% were concerned about pollution, and 11% were concerned about odour (Figure 7.19). Other answers included waste management and noise pollution.

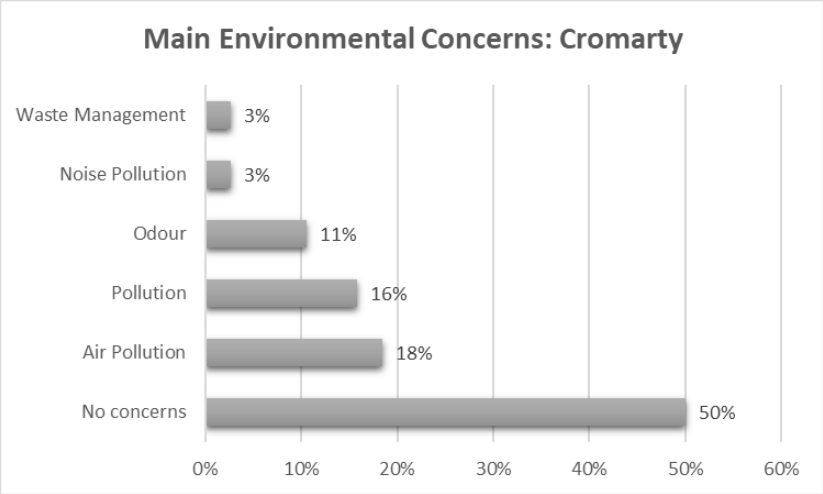

Figure 7.19: Main Environmental Concerns: Cromarty

Alternative land uses

When asked about alternative uses for the land, no suggestions made by any of the community members.

What the Community can offer the Project

67% of the community members of Cromarty interviewed felt that the community could offer workers to the project (Figure 7.20).

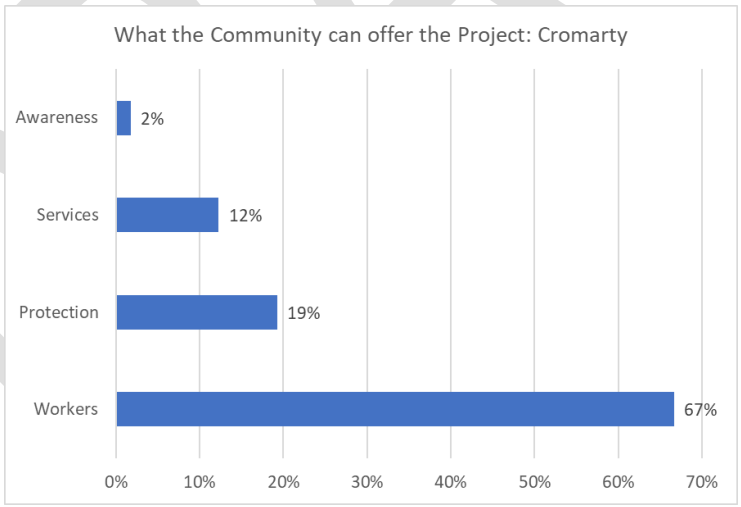

Figure 7.20:What the Community can offer the Project: Cromarty

7.1.2.4 Windsor Road

Community Approval of Project

Of the 59 respondents from Windsor Road, 100% either highly approve or approve of the project and 100% consider the project necessary or very necessary (Figure 7.21). In both cases no persons interviewed did not approve of the project and thought it was unnecessary.

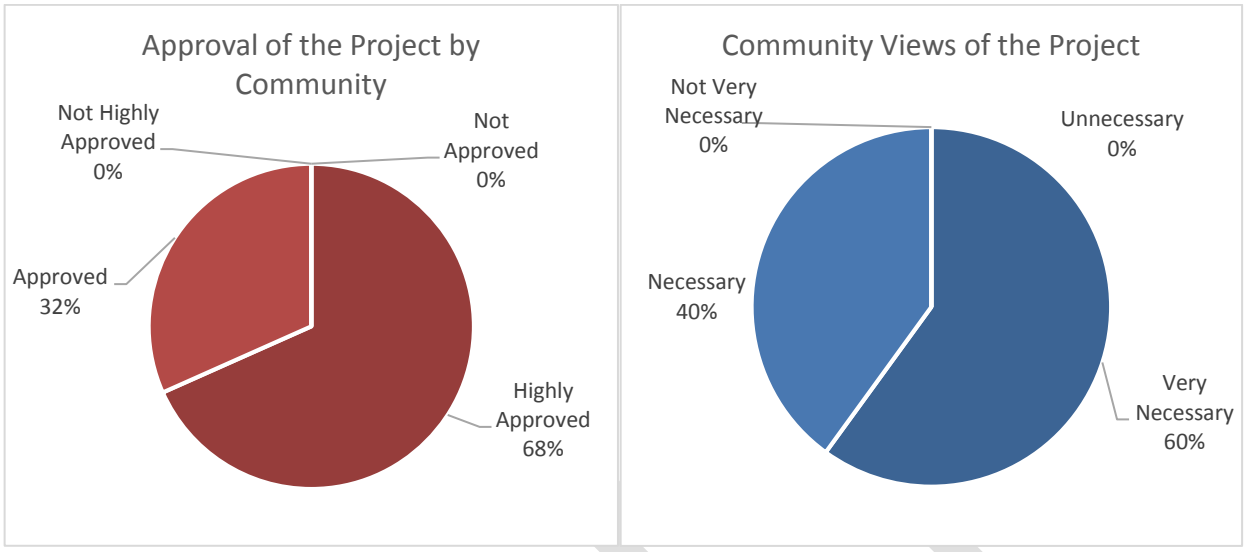

Figure 7.21: Approval of Project by the Community (left); Community Views on the Project (right)

Fears/reservations

The community members interviewed were asked to identify any specific fears or reservations that they had about the project. The responses yielded that about 72% of persons expressed no fears, but of those that did foul odour, fire and pollution were the most prevalent issues expressed (Figure 7.22).

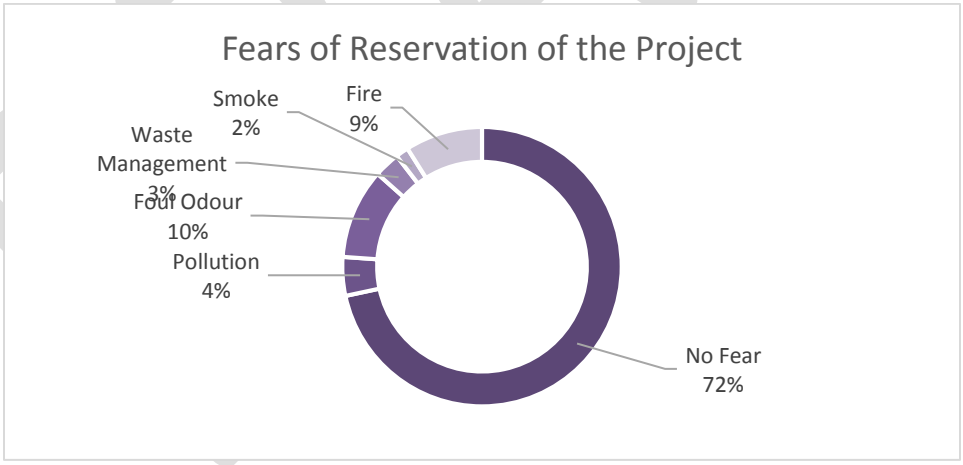

Figure 7.22: Fears or Reservations about the Project

Main benefits

Community members were also asked to identify any benefits they saw from the overall project development in the area. Of the responses, 75% said employment is the main benefit (Figure 7.23). Roads, street lights and community development projects were some of the other common responses.

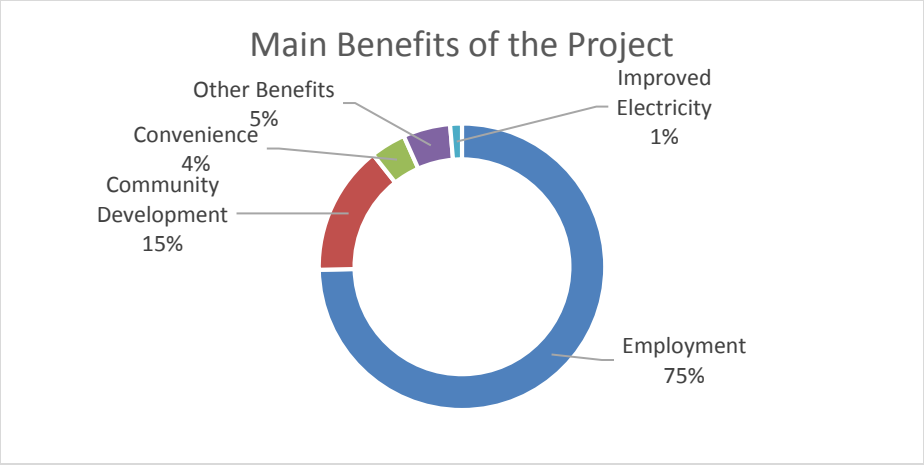

Figure 7.23: Main Benefits from the Project

Environmental concerns

Community members were also asked to indicate any environmental concerns they had related to the proposed development. Of the responses received, 12% of persons were concerned about pollution in general, 15% were concerned about air pollution and 10% were concerned about odour (Figure 7.24). Other answers included smoke, fire and waste management. 48% of the respondents had no main environmental concern.

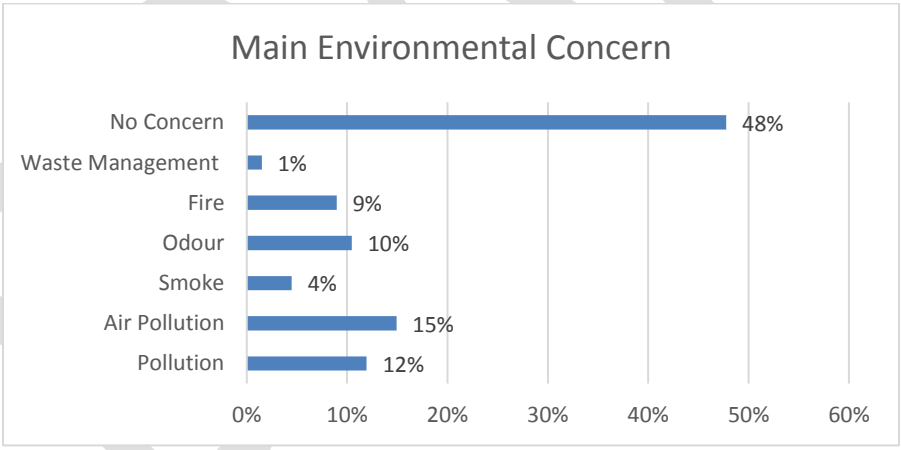

Figure 7.24: Main Environmental Concerns

Alternative land uses

When asked about alternative uses for the land, no suggestions were made by any of the community members.

What the Community can offer the Project

72% of the community members interviewed felt that the community could offer workers to the project (Figure 7.25).

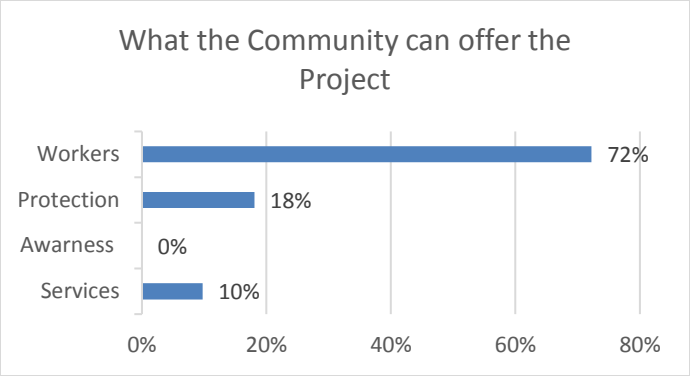

Figure 7.25:What the Community of Windsor Road can offer the Project

8 IMPACTS IDENTIFICATION AND ANALYSIS

The construction and operation phase activities were analysed for potential impacts, and these were evaluated based on their direction, magnitude, duration and type of impact. The detailed impact assessment criteria are defined in Table 8.1 to Table 8.3. Assessment of the potential impacts of various activities entails consideration of short duration reversible impacts, long term permanent impacts and those with medium term significance. Impacts may be positive, negative or benign. It is important to note that the project may have impacts on the natural as well as built environment, and importantly the project can be affected by environmental processes.

Table 8.1: Impact assessment criteria for quantitative analysis

Impact characteristic	
Direction of impact	
Rank	**Definition**
Positive	Impacts of project on the environment and vice versa are likely to be good
Negative	Impacts of project on the environment and vice versa are likely to be bad
Magnitude of impact	
Rank	**Definition –** one/the combination of
Low	• Little or negligible action and/or control are useful, but not required in the short term, review in the future is useful • Exceeding of threshold value in case of operating problems (abnormal conditions) and low effect and low probability of occurrence and/or high probability of detection. • Minimal effect • Limited probability of occurrence • "Aspect" controlled under normal conditions • High knowledge of "Aspect"

Impact characteristic	
Direction of impact	
Rank	**Definition**
Moderate	• Action and/or control are required in the near future • Exceeding of threshold values in case of operating problems (abnormal conditions) and above • average high probability of occurrence and/or low probability of detection. • Financial threat • Effect likely to increase under planned activities • Rising concern of shareholders • Emergency situation would cause a large environmental impact • Complaint likely to be received "Aspect" not fully controlled under normal conditions
High	• Immediate Action and/or • control is mandatory • Aspect" is currently not controlled under normal operations. • Could break legal or policy documents. • In breach of legislation • Sensitive environment (groundwater proximity, conservation area, residential area) • Repeated complaints

Table 8.2: Definition of impact durations

Duration	Description
Short term	Occurring infrequently or during one project phase
Medium term	Occurring frequently during a few project phases
Long term	Occurring frequently during most or all project phases
Persistent	Occurring for a significant period after completion of construction and demobilization or on a permanent basis due to operation of revetment structures.

Table 8.3: Type of Impact

Rank	Description of action
Reversible	Effects which reversible and diminish when activities cease or over time.
Irreversible	Effects which are not reversible and do not diminish even if the activity ceases to occur, and do not diminish with time.

8.1 Construction Phase

This Section elaborates on the potential impacts that the proposed development may have on the site and situation as well as potential impacts that the site and situation may have on the development during the construction phase. These are discussed under the headings: physical, biological and socioeconomic impacts.

8.1.1 Physical

The main potential physical impacts relate to air, noise, water, hydrology and drainage. Sections 5.1.1.1 to 5.1.1.3 presents details.

8.1.1.1 Air Quality and Noise

Air Quality

The main potential adverse impact on air quality from activities of the Construction Phase is an increase in air pollutants and dust. This can arise from the following sources:

- From of vegetation for land preparation
- Improper storage and transportation of fine earth material
- Burning of vegetation and/or construction/domestic waste
- Fugitive dust from unpaved roads

An increase in air pollutants and dust can potentially result in adverse health impacts on contractors, employees, residents and properties in the surrounding areas.

Noise

Noisy activities in the construction phase of the development can arise during:

- Land clearing activities
- Vehicular traffic
- Operation of heavy equipment
- Operation of JPS generators

Sustained high levels of noise for prolonged periods overtime can result in adverse health impacts especially on the hearing of contractors, employees, residents and properties in neighbouring areas.

8.1.1.2 Hydrology and Drainage

As indicated in Section 6.1 above, the site does not drain well due to the clayey nature of the soil. As such, appropriate drainage pathways will need to be put in place during the construction period. This is to control sediment run-off due to land clearing and exposed surfaces as well as to reduce run-off to storm water drain off-site (i.e. Town Gully).

8.1.1.3 Water Quality

The likely main water quality issues to arise from activities of the Construction Phase include:

- *Increased sediment runoff* – resulting from land clearing and improper storage of fine earth material near to drains and or stream
- *Contamination from sewage* – from the disposal of improperly treated or untreated sewage
- *Disruption of surface water and changes in hydrologic regime* – due to improper storage of construction material or refuse as well as the removal of exiting natural drains without appropriate alternatives

These may result in several negative impacts. Increases in sediment run off can cause damage to aquatic life in the natural drainage features and can also result in flooding as there is disruption in the hydrological regime. Additionally, pollution from the leaching of construction spoils or other land-based activities. Also, contamination from sewage can result in odours, contamination of water features with pathogenic organisms, which can lead to the spread of water borne diseases, pollution of receiving water bodies as well as damage to aquatic life.

8.1.2 Ecology

Based on the baseline ecological environment, the perceived impact on the ecological environment is likely to be small. Impacts related to the design and construction phase are elaborated below.

1. The ecological impact is expected to be minimal because the immediate location is not deemed to be ecologically sensitive or complex. It is important to note that the final end point to the Town Gully is within the boundary of the Portland Bight Protected Area south of the site as such the development's effluent should be within standards to ensure that there are no negative ecological impacts downstream such as eutrophication and anoxia. There will likely be potential ecological impact downstream of site if sewage and solid waste is not managed to standard.

2. The generation of fugitive dust during transportation, site preparation and construction activities could coat the nearby ecosystems in a layer of dust. This dust can negatively impact ecology within the affected zone, particularly flora, causing a reduction in photosynthetic rate due to shading of the leaf surfaces, increasing leaf temperatures and blocking stomata preventing or reducing diffusion. This is not expected to be significant once regular wetting is done.

3. Though minor, the noise generated from site preparation and construction activities could negatively impact organisms that communicate using vocalization, for example, grasshoppers, tree lizards.

4. Crocodiles are known to be in the area and are attracted to areas of water ponding, the Town Gully and areas where a food source is available. Mitigation measures will need to be put in place in the event of any siting within the construction zone.

5. *Hylocereus Triangularis* was recorded on the project site but not within the footprint of the development. This area that this species was identified is near the Town Gully which will not be developed. However, should this area be developed in future, this species will be relocated to a plant nursery as required by NEPA.

8.1.3 Socioeconomic

8.1.3.1 Employment

The availability of employment opportunities is a potential positive impact anticipated from this development. Jobs will be available during the construction phase; however, the client is unable to estimate how much might be available during this period because it would be dependent on the Construction Contractor who will be tendered for and hired later in the project cycle.

Although numbers are not yet determined, should there be a lot of jobs available during the construction period, there can be short-term disturbance, related to crime and squatting due to large numbers of outside constructions workers.

8.1.3.2 Traffic

Currently, traffic in the area is very light and with the additional development, it is anticipated to result in an increase in vehicular movement during the construction phase. To prevent potential road accidents from trucking.

8.2 Operation Phase

8.2.1 Physical

8.2.1.1 Air Quality and Noise

Air Quality

During operations, the development may likely result in a long-term increase in air pollutants and dust from activities such as having cleared exposed lands; fugitive dust from unpaved roads; air emissions from operations (namely stack of protein recovery plant, and JPS power plant and potential leaks from LNG storage tanks, pipelines and vehicles); and air emissions from vehicles. This can result in adverse health impacts on contractors, employees, nearby residents and properties.

Air emissions and odours, if not adequately mitigated, are likely to be a nuisance to nearby businesses such as DaCosta Farms and other nearby farmers, passers-by and residences that are within 1 to 2 km of the development, if not adequately mitigated. Visibility may also be impaired. Residents would include those of Hill Run proper, Cromarty Grove, Duncan's Pen and Windsor Road. Appropriate stack height as guided by air dispersion modelling and the use of scrubbers are key in ensuring that these communities are not negatively impacted.

With respect to the poultry processing plant, there are plans to install scrubbers and back-up scrubbers to ensure that stack emissions are cleaned.

With respect to the JPS power plant, they will be using LNG, which emits 50-60% less carbon dioxide and minute levels of Sulphur dioxide and particulate matter, unlike with the use of fossil fuels. This is a positive impact as it will reduce the carbon footprint of the CB and JPS operations. This contribute' s to Jamaica's energy policy and strategic direction to reduce Jamaica's overall green-house gas emissions by using cleaner fuel.

The main air pollutant from their operations may be oxides of nitrogen, carbon monoxide and VOCs, heat and noise.

Noise

Noise may also be a result of the facility's operations and from the use of heavy equipment and vehicular traffic. This can result in potentially negative impacts on the health especially the hearing of contractors, employees, and surrounding residents.

8.2.1.2 Hydrology and Drainage

Runoff from the site will not create drainage impacts. Drains will be constructed from the plant to the existing drainage lines that eventually discharges into the Town Gully. The farm area, being more than 40 times larger than the factory site, will generate the larger and more significant runoff to the Town Gully, but, even this discharge at peak flow conditions is not significant compared to the upstream flows in the Town Gully. The plant site is approximately 2.5% of the size of the farm area and the plant site and downstream of the site will be impacted by this flow in the Town Gully coming from the runoff upstream of the site. The runoff from the plant will not create a significant increase to the flows in the Town Gully and the controlling factor to potential flooding downstream is from water upstream of the CB facility.

The overflowing Town Gully will flood sections of the lower farm but not the plant site. However, it is important for the Town Gully just upstream of the plant site to remain clear in order to carry the flows beyond the plant site. The issue of protecting the farm from flooding needs careful consideration because of the downstream risk.

8.2.1.3 Water Quality

During operations, there can be a potential increase in drainage and surface run-off should there be exposed surfaces. This can potentially result in flooding, infrastructural damage, and siltation of receiving waters.

Water pollution due to sewage and trade effluent from the Poultry Processing and Protein Recovery Plant can also be a potentially negative impact from the development should there be disposal of improperly treated or untreated sewage and/or trade effluent. This can potentially result in the emission of odours, the contamination of water with pathogenic organism, the spread of water borne disease, eutrophication of receiving water bodies, and damage to aquatic life in the nearby drainage features.

8.2.1.4 Human-Induced Risks

The primary hazards associated with storage, handling, and transportation of LNG include fires and explosions that may be caused by a loss of containment/leakages. LNG is typically stored at low pressure at its boiling point of –260°F. LNG containers must be insulated to keep the LNG in liquid form. As a consequence of the low storage pressures of LNG containers, a breach typically causes liquid to flow out at lesser velocities than LPG. The resulting cryogenic LNG liquid spill will boil to create a cold, dense vapor cloud.

Daily transportation of LNG to the site exposes road users to potential risks such as leakages and spillages, which can cause a fire should there be a spark. Additionally, road accidents can occur if the proper measures are not put in place.

The storage of at least 5 days of LNG on site will mean that there is also a risk of potential leakages and fire hazards on site. It is in the best interest of NFE, CB and JPS to ensure that mitigation measures are followed to prevent any negative impacts on site.

8.2.2 Ecology

Improper management of wastewater could encourage long term negative impacts downstream.

8.2.3 Socioeconomic

8.2.3.1 Employment

The availability of jobs is one possible impact anticipated from this development. During the operation phase, whilst there will be approximately 130 to 150 jobs available to fill several areas including the processing plant, security, ancillary and office staff, residents must bear in mind that CB will retain much of their existing staff members currently stationed at the soon to be closed Arnold Road Factory.

8.2.3.2 Traffic

Currently, traffic in the area is very light but with the development, an increase in vehicular movement during the operation phase is anticipated during the operation phase. This increase is not expected to result in congestion since the area is characterized by low density traffic. As such, the risk of accidents may not be very high impeding the anticipated 2.4 truck deliveries of LNG to the site on a daily basis.

8.2.3.3 Migration

Perceived and real employment opportunities will attract persons to the area in search of jobs. This may result in an increase in the number of persons living in the areas, but these workers will have minimal impacts on existing housing, water and other resources. Further, domestic water is provided by the public utility National Water Commission and there are no issues with respect to water rights.

8.2.3.4 Achieving Objective for Import Substitution

CB's processing technology and safety has improved and as such they will be producing a better and more efficiently produced chicken product. This results in a higher production of processed chicken thus helping to achieve Jamaica's objective for import substitution. This may also result in a potential increase in exports. These are positive impacts for the Jamaican economy.

8.2.3.5 Health Risks

Potential emissions from the JPS power plant and CB's poultry processing plant, if left unmitigated, can pose a possible health risk for surrounding communities should the wind transport emissions to residential areas north and south of the site at different times of the day. This can result in persons developing respiratory illnesses.

8.3 CUMULATIVE IMPACTS

8.3.1 Natural Hazards and Climate Change

Earthquake

The geology and soils of the site render it vulnerable to liquefaction as a result of earthquakes. The site is also currently vulnerable to flooding from heavy and persistent rainfall. Projected climate change impacts that are likely to affect the site include more variable and intense periods of rainfall and more intense hurricanes. Due to the soil type of the site and its proximity to the Town Gully which often floods this means that the site will be even more vulnerable to flooding.

Tropical Cyclones causing flooding

The site should be elevated above the influence of the flooding from the Town Gully. In addition, the building should also be elevated. The interior of the building should also be designed in such a way that if flooding does affect the site, critical equipment will not be affected. They should be water proofed and raised.

Tropical Cyclones causing wind damage

It is important to note that there are differentiated risks associated with horizontally and vertically positioned tanks. Some consideration should be given to the use of horizontal LNG tanks since there is a greater risk posed by hurricanes and storms with high wind speeds to potentially negatively impact vertical tanks.

8.3.2 Flooding

The project site and surrounding communities already have an existing problem with flooding (after heavy downpours). This challenge may worsen due to changes in topography, drainage features, new infrastructure and removal of vegetation. Flood risk could be a possible long-term risk to the development itself. Stagnant water in communities also poses a health risk to its members (vector borne diseases, contaminated water, etc.) if not mitigated. Mitigation measures for drainage as described in Sections 5.2.1.2 above are key in significantly reducing these issues.

8.3.3 Water Quality

Without proper treatment of wastewater on site prior to discharge, this can result in the increase in nutrients, such as nitrates and phosphates running into the Town Gully, which is used by farmers downstream prior to emptying in the Portland Bight Protected Area.

This can compound the negative impacts downstream since north of the property there are several drains from various roadways, which already empty into the Town Gully.

It is therefore important that CBG treats their wastewater to meet the trade effluent standards produced by NEPA. So far, CBG has indicated that they are committed to ensuring that the effluent from their wastewater treatment plant exceeds the NRCA standards for effluent quality.

8.3.4 Employment

During both the construction and operation phase for the development employment will be offered by CBG. Various levels of skilled and unskilled labour will be required during both phases as well as the provision of goods and services. The will add to the overall job opportunities available within the area over the short- to medium-term.

8.3.5 Development

The CBG development may encourage other developments to take place within the area, opening up a wider range of services offered and greater opportunity for development. Since CBG has been in the area, residents have reported improvements to both the road network and to drainage, so it is anticipated that their expanded presence will foster an overall improvement in the area.

8.3.6 Solid Waste Management

The demands for increased solid waste management capabilities will be inevitable with the proposed development. Solid waste collection trucks have already been reported as inconsistent. The developers will therefore need to make their own arrangements for solid waste collection and disposal.

8.3.7 Water Supply

Water supply to the site will be via well water. Well water results already show signs of salinity and with the risk of climate change and sea level rise, this issue will likely increase, impacting negatively on the treatment equipment and the cost of treatment.

8.3.8 Housing

With an influx of persons within the area in search of employment both temporary and permanent, it is possible that persons will seek to live in the area. The developers as well as the social services must be vigilant of any potential problems of squatting and crime arising and be prepared to cooperatively mitigate them as soon as they are detected.

8.3.9 Traffic

The Hill Run area is characteristic of low-density traffic. However, with a potential increase in persons living in the area and the increase in traffic to and from CB's site as well as the anticipated 2.4 truck deliveries of LNG, there is an anticipated increase in traffic in the area. This increases the potential for accidents especially with road conditions that are no good in some parts and with continued downpours that damage the road surface, accidents may likely increase along the thoroughfare.

8.3.10 Corporate Social Responsibility

The developer could consider making improvements to at least a section of the Town Gully as a part of their Corporate Social Responsibility. Hill Run altogether is known to have has a longstanding drainage issue. An improvement to the drainage will result in a reduction to the flooding issues and damage in the road surface which has also been a longstanding issue in this area. Based on community consultations, CBG has made improvements to the area in the past and the community members look forward to a continued relationship with CBG.

CBG is already continuing their CSR programme since they have to date held discussions with NWA who gave them the permission to clean the Town Gully from Highway 2000 in the north to the private road south of Imagination Farms and to straighten it in parts. This process is almost complete.

9 MITIGATION

9.1 Construction Phase

This Section elaborates on the mitigation measures associated with the potential impacts described in Section 8 above related to the proposed development during the construction phase. These are discussed under the headings: physical, biological and socioeconomic impacts.

9.1.1 Physical

The main mitigation measures relate to air, noise, water, hydrology and drainage. Sections 9.1.1.1 to 9.1.1.3 presents details.

9.1.1.1 Air Quality and Noise

Air Quality

Suitable mitigation measures to minimize these impacts include:

- Clear only areas needed for the construction of roads and other infrastructure
- Install Construction Dust screens around site
- Frequently wet site to reduce fugitive dust
- Re-grass or pave exposed ground as soon as possible
- All fine earth material should be covered while stored on site.

Noise

Sustained high levels of noise for prolonged periods overtime can result in adverse health impacts especially on the hearing of contractors, employees, residents and properties in neighbouring areas. The following are mitigation measures that could reduce the risk of this potentially negative impact of the development.

- Temporary noise barriers can be erected as needed around specific activities anticipated to be very noisy, using plywood or any other absorbing material for the duration of that activity.
- Ensure equipment is properly maintained
- Work activity should be scheduled to control noise exposure.
- High noise areas should be identified, and appropriate personal protective gear worn.
- Stationary noise sources like generators and compressors should be positioned as far as possible from noise sensitive receivers such as workers.
- Noise reducing measures in keeping with best practices should be used when installing the generators.

9.1.1.2 Hydrology and Drainage

Mitigation measures fostering natural infiltration will not be best suited and as such drains will need to be constructed. Drains can take the form of grassed swales as well as concrete drains to filter water offsite. Despite poor drainage, it is still recommended that only the areas for construction be concreted so that remaining unused lands from the property remain grassed/vegetated to limit the total water ad sediment run off from the property and contribution of flood waters downstream.

Additionally, excavated material should not be stored along drains, gullies, swales or in the path of natural drainage. Stockpiles should have a berm and should be covered, and the natural drainage should not be blocked without suitably engineered alternatives.

CB has to date held discussions with NWA who gave them the permission to clean the Town Gully from Highway 2000 in the north to the private road south of Imagination Farms and to straighten it in parts. This process is almost complete and would also help to alleviate flooding issues.

9.1.1.3 Water Quality

The following are mitigation measures that can be employed to reduce these potentially negative impacts:

Sediment runoff

- Fine earth material should be stored away from drainage path and properly bermed
- Excavated material should not be stockpiled onsite
- Paving or grassing of exposed grounds as soon as possible

Sewage

- Portable toilet should be placed on the site for the use by workmen
- Workmen should be sensitized on the use these facilities
- Monitors should be used to ensure these facilities are used and properly maintained.
- Proper use and maintenance of facilities should be monitored

Disruption of surface water

- Excavated material should not be stored along drains or in the path of natural drainage

9.1.2 Ecology

The following are mitigation measures that can be employed to reduce the potential negative impacts outlined above.

1. Wetting of the construction site and materials during construction or until roads are paved will minimize the fugitive dust impacts on the surrounding vegetation.
2. Appropriate solid waste and sewage disposal as mentioned above (Section 5.1.1.3)
3. An environmental management plan (EMP) should be prepared before the start of construction. This should include procedures for contacting NEPA should there be crocodile siting, and this should be fully communicated to all workers.

9.1.3 Socioeconomic

9.1.3.1 Employment

To control any short-term disturbances due to workers, a Worker Liaison officers should be deployed to manage the likely influx of workers. It is important that there is control of squatting on the outskirts of the project site. Appropriate security measures should also be installed on property.

9.1.3.2 Traffic

To prevent potential road accidents from trucking, it is important that trucks are not overloaded, and drivers are appropriately screened to ensure they are qualified to operate respective vehicles and prevent potential accidents during the transport of construction material. Additionally, trucks should be covered appropriately.

9.2 Operation Phase

9.2.1 Physical

9.2.1.1 Air Quality and Noise

Air Quality

Appropriate stack height as guided by air dispersion modelling and the use of scrubbers are key in ensuring that these communities are not negatively impacted.

With respect to the poultry processing plant, there are plans to install scrubbers and back-up scrubbers to ensure that stack emissions are cleaned.

With respect to the JPS power plant, they will be using LNG, which emits 50-60% less carbon dioxide and minute levels of Sulphur dioxide and particulate matter, unlike with the use of fossil fuels. This is a positive impact as it will reduce the carbon footprint of the CB and JPS operations. This contribute' s to Jamaica's energy policy and strategic direction to reduce Jamaica's overall green-house gas emissions by using cleaner fuel.

The main air pollutant from their operations may be oxides of nitrogen, carbon monoxide and VOCs, heat and noise. The following are some mitigation measures that can be employed to reduce this impact:

- Air dispersion modelling of emissions from the operation should be done and the necessary mitigative measures implemented, such as the installation of stack scrubbers for the Protein Recovery Plant and stack scrubbers or catalysts to remove oxides of nitrogen, carbon monoxide and unburnt fuel from the emission stack at the JPS Power Plant.
- Gas recovery and leak detection systems in keeping with industry best practices should be a part of the NFE operations.
- Vehicles should be properly maintained to ensure they are always working optimally.
- Scheduled monitoring should be done to ensure compliance with the regulatory and best practices standards.

Noise

The following are some mitigation measures that can be employed to reduce the potential impact:

- Occupational health and safety standards should be implemented
- All equipment and vehicles should be properly maintained
- Noise reducing measures in keeping with best practices should be used when installing the generators.
- Buffer zones using trees can be used to reduce impacts of vehicular traffic from nearby busy thoroughfare.
- Noise assessment should be conducted during start up to identify areas where there may be elevated noise levels. Mitigative measures such as the use of noise reduction dampers should be implemented where possible.
- Workers should wear the appropriate personal protective gears.

9.2.1.2 Hydrology and Drainage

Drains constructed at the plant will discharge the runoff generated at the plant site to the Town Gully and it is imperative that the downstream section of the Town Gully be able to receive this flow. Maintenance of the Town Gully is not the responsibility of CB, but it is in the company's interest to liaise with the municipality to keep it clean enough to allow for adequate storm water transport away from the CB property. That will involve periodically removing silt and debris and controlling the growth of vegetation within the channel. Control of the vegetation must be manual as herbicides cannot be used because of the downstream demands on that water for farming purposes including irrigation and aquaculture.

Given this issue, CB has to date held discussions with NWA who gave them the permission to clean the Town Gully from Highway 2000 in the north to the private road south of Imagination Farms and to straighten it in parts. This process is almost complete.

Floor levels in the plant must be elevated to a minimum of 150 mm above grade and the access roads at a minimum of 450 mm above grade. Flooding is not anticipated at the plant site.

9.2.1.3 Water Quality

The following are some mitigation measures that can be employed to reduce the potential impacts:

- All sewage and/ or trade effluent should be properly treated to the tertiary levels prior to its discharge into the environment
- The treatment facility use for the treatment of sewage and trade effluent should be appropriately designed, maintained and operated by trained personnel
- Scheduled monitoring of the effluent from such the system should be undertaken to ensure the treatment process is working effectively
- It is anticipated that the quantity of sewage produced by JPS will be estimated and this information given to CB to be incorporate in the final wastewater design. A good estimation of the type and if possible, the quality of the trade effluent generated from the wash down and

maintenance process should be made by JPS. Effluent contaminate with fuel or chemicals will need pre-treatment prior to sending it the wastewater treatment plant.

9.2.1.4 Human-Induced Risks

The following are some mitigation measures that can be employed:

1. Methane is the main constituent of liquified natural gas (LNG), while this gas is not harmful to human and animals in large concentrations it carries significant environmental risk due to its flammability and green-house effect. NFE should ensure that the gas recovery system to condense evaporated gas and the systems for fire and gas detection conforms to industry best practices.
2. The training of staff to respond to system alerts and other emergencies should be ensured. The emergency response plan for the CB facility should incorporate procedures to deal with emergencies occurring on both the JPS and NFE properties.
3. Siting of the storage tanks should also be considered with respect to risks from extreme events, such as earthquakes and hurricanes. The topography of Hill run makes it highly exposed to high winds that accompany hurricanes.

9.2.2 Ecology

Improper management of wastewater can be addressed through the proper treatment of effluent prior to any discharge into the Town Gully. Also, an EMP should be prepared for the operation phase so that the appropriate monitoring of effluent is done.

9.2.3 Socioeconomic

9.2.3.1 Health Risks

It is imperative that CB and JPS implement mitigation measures outlined above under Section 9.1.1.1 and 9.2.1.1.

9.3 Matrix of Potential Impacts and Mitigation

Table 9.3.1: Compiled Matrix of Potential Impacts and Mitigation

Activities/ Main Issue	Possible Impacts	Possible Impacts				Mitigation Measures
		Direction	Duration	Magnitude	Type	
Land Preparations and Construction Phase						
Vegetation Cover Removal of vegetation for land preparation	Loss of vegetation cover	Negative	Short Term	Major	Reversible	• Clear only areas needed for construction of roads and other infrastructure
Air Quality Land clearing Improper storage and transportation of fine earth material Burning of vegetation and/ or construction/ domestic waste Fugitive dust from unpaved roads	Increase in air pollutants and dust Adverse health impacts on contractors, employees, residents and properties in surrounding areas	Negative	Short Term	Major	Reversible	• Install Construction Dust screens around site • Frequently wet site to reduce fugitive dust • Re-grass or pave exposed ground as soon as possible • If development is done in phases, clear only land which is currently being worked on. • All fine earth material should be covered while stored on site. • There will be no burning of vegetation and/ or construction/ domestic waste on site.
Noise Land clearing activities	Elevated Noise levels Adverse health impacts on contractors, employees,	Negative	Short Term	Major	Reversible	• Temporary noise barriers can be erected as needed around specific activities anticipated to be very noisy, using plywood or

Activities/ Main Issue	Possible Impacts	Possible Impacts				Mitigation Measures
		Direction	Duration	Magnitude	Type	
Vehicular traffic Operation of Heavy equipment Operation of JPS Generators	residents and properties in neighbouring areas.					any other absorbing material for the duration of that activity. • Ensure equipment is properly maintained • Work activity should be scheduled to control noise exposure. High noise areas should be identified, and appropriate personal protective gear worn. Stationary noise sources like generators and compressors should be positioned as far as possible from noise sensitive receivers such as workers. • Noise reducing measures in keeping with best practices should be used when installing the generators.
Drainage and Sedimentation Vegetation clearance Removal/blocking of existing natural drains	• Exposure of soil to erosion • Aggravated Sediment runoff • Damage to aquatic ecology • Disruption of natural storm water runoff • On-site and downstream flooding	Negative	Short Term	Significant	Reversible	• Paving or grassing of exposed grounds as soon as possible • Excavated material should not be stored along drains, gullies, swales or in the path of natural drainage. Stockpiles should have a berm and should be covered. • Natural drainage should not be blocked without suitably engineered alternatives

Activities/ Main Issue	Possible Impacts	Possible Impacts				Mitigation Measures
		Direction	Duration	Magnitude	Type	
Improper storage /disposal of construction material or refuse near to drains, or gullies	from blocked drainage ways • Pollution from leaching of construction spoils or other land-based activities					
Sewage Management Improper Disposal of sewage	• Odours • Contamination of water with pathogenic organisms • Spread of water borne disease • Pollution of receiving water bodies • Damage to aquatic ecology	Negative	Short Term	Major	Reversible	• Portable toilets should be placed on the site for the use by workmen • Workmen should be sensitized on how to use these facilities • Proper use and maintenance of facilities should be monitored Monitors should be used to ensure these facilities are used and properly maintained.
Solid Waste Management Dumping of earth material Dumping of waste from worker activities	• Blocking of drainageways • Breeding of vectors - public health nuisance • Site Aesthetics	Negative	Short term	Moderate	Reversible	• Appropriate storage of spoil has been mentioned above. • Design and implement system for solid waste collection and removal from site by licensed operators to approved disposal site.

Activities/ Main Issue	Possible Impacts	Possible Impacts				Mitigation Measures
		Direction	Duration	Magnitude	Type	
Dumping and disposal of waste from construction activities						
Ecology Removal of vegetation Sewage and solid waste management Dust generation	• Potential ecological impact downstream of site if sewage and solid waste not manged to standard. • The generation of fugitive dust during transportation, site preparation and construction activities could coat the nearby vegetation with a layer of dust, reducing photosynthetic rate. • Though minor, the noise generated from site preparation and construction activities could negatively impact organisms that communicate using vocalization, for example, grasshoppers, tree lizards.	Negative	Short term	Moderate	Reversible	• Wetting of the construction site and materials during construction or until roads are paved will minimize the fugitive dust impacts on the surrounding vegetation. • Appropriate solid waste and sewage disposal as mentioned above • An environmental management plan (EMP) should be prepared before the start of construction. This should include procedures for contacting NEPA should there be crocodile siting, and this should be fully communicated to all workers.

Activities/ Main Issue	Possible Impacts	Possible Impacts				Mitigation Measures
		Direction	Duration	Magnitude	Type	
	• Crocodiles are known to be in the area and are attracted to areas of water ponding, the Town Gully and areas where a food source is available.					
Employment opportunities	The availability of jobs is one main positive impact anticipated from this development. Jobs will be available during the construction phase. Short-term disturbance related to crime and squatting due to large numbers of outside construction workers.	Positive	Short-term	Moderate	Reversible	Worker liaison officers to be deployed Control of squatting on outskirts of project site. Install appropriate security measures on property
Traffic and potential accidents	Increase in vehicular movement during the construction phase and the potential for accidents from trucks brining construction material.	Negative	Short term	Minor	Reversible	• Trucks should not be over-loaded • Materials should be appropriately covered. • Use screening mechanisms to ensure drivers are appropriately qualified to operate respective vehicles in order to reduce probability of accidents during the transport of construction material.
Operation Phase						

Activities/ Main Issue	Possible Impacts	Possible Impacts				Mitigation Measures
		Direction	Duration	Magnitude	Type	
Air Quality Emissions from: • Stack of Protein Recovery Plant • Stack of JPS Power plant • Potential leaks from LNG storage tanks and pipelines • Vehicles	Elevated particulate levels can result in adverse health impacts on contractors, employees, residents and properties in surrounding areas Poor air quality may also have deleterious effect on adjoining farming operations. Visibility can be impaired	Negative	Long Term	Major	Reversible	• Air dispersion modelling of emissions from the operation should be done and the necessary mitigative measures implemented. • Install stack scrubbers for the Protein Recovery Plant • Install stack scrubbers or catalysts to remove oxides of nitrogen, carbon monoxide and unburnt fuel emission stack at the JPS Power Plant. • Gas recovery and leak detection systems in keeping with industry best practices should be a part of the NFE operations • Vehicles should be properly maintained to ensure they are always working optimally. • Periodic monitoring should be done to ensure compliance with the regulatory requirements and environmental best practice levels.
Noise Factory operations Vehicular traffic Trucking Heavy equipment	• Elevated noise levels on site • Elevated noise levels from adjacent road traffic	Negative	Long Term	Moderate	Reversible	• Occupational Health and safety Standards should be implemented • All equipment and vehicles should be properly maintained

Activities/ Main Issue	Possible Impacts	Possible Impacts				Mitigation Measures
		Direction	Duration	Magnitude	Type	
						• Buffer zones using trees can be used to reduce impacts of vehicular traffic from nearby busy thoroughfare • Noise assessment should be conducted during start up to identify areas where there may be elevated noise levels. Mitigative measures such as the use of noise reduction dampers should be implemented where possible • Workers should wear the appropriate personal protective gears.
Flooding	Overflow from the Town Gully will flood sections of Imagination farms south of the site but not the plant site. It is, however, important for the Town Gully just upstream of the plant site to remain clear in order to carry the flows beyond the plant site. The issue of protecting the farm from flooding needs careful consideration because of the downstream risk of	Negative	Long Term	Significant	Reversible	• Maintenance of the Town Gully is not the responsibility of CB, but it is in the company's interest to liaise with the municipality to keep it clean enough to allow for adequate storm water transport away from the CB property. CB has to date held discussions with NWA who gave them the permission to clean the Town Gully from Highway 2000 in the north to the private road south of Imagination Farms and to straighten it in parts. This process is almost complete.

Activities/ Main Issue	Possible Impacts	Possible Impacts				Mitigation Measures
		Direction	Duration	Magnitude	Type	
	flooding upon addressing this issue at Imagination farms.					• Involves periodically removing silt and debris and controlling the growth of vegetation within the channel of the Town Gully. • Control of the vegetation must be manual as herbicides cannot be used because of the downstream demands on that water for farming purposes including irrigation and aquaculture. • Floor levels in the plant must be elevated to a minimum of 150 mm above grade. • Access roads are to be at a minimum of 450 mm above grade.
Drainage and surface run-off	Sediments from areas without foliage during rainfall periods can result in flooding, infrastructural damage and siltation of receiving waters.	Negative	Long Term	Significant	Reversible	• All expose ground should be paved or grassed • Buffer zones near to gullies or other water ways can be established using trees, grass etc. to reduce sediments getting into these systems.
Water pollution due to sewage and trade effluent	Disposal of improperly treated or untreated sewage and/or trade effluent from the Poultry Processing and Protein Recovery Plant can potentially result in:	Negative	Long Term	Significant	Reversible	• All sewage and/ or trade effluent should be properly treated to the tertiary levels prior to its discharge into the environment • The treatment facilities used for sewage and /or trade effluent

Activities/ Main Issue	Possible Impacts	Possible Impacts				Mitigation Measures
		Direction	Duration	Magnitude	Type	
	• Emission of odours • Contamination of water with pathogenic organism. Spread of water borne disease • Eutrophication of receiving water bodies • Damage to Aquatic ecolog					should be appropriately sized, designed, maintained and operated by trained personnel. • Scheduled monitoring of the effluent from the system should be implemented to ensure the treatment process is working effectively. • It is anticipated that the quantity of sewage produced by JPS will be estimated and this information given to CB incorporate in the final wastewater design. A good estimation of the type and if possible, the quality of the trade effluent generated from the wash down and maintenance process should be made by JPS. Effluent contaminate with fuel or chemicals will need pre-treatment prior to sending it the wastewater treatment plant.
Limited discharge into the Town Gully	Limited discharge into the Town Gully due to usage of treated effluent from WWT Plant for irrigation.	Positive	Long Term	Major	Reversible	-
Solid Waste Management	• Breeding of vectors - public health nuisance	Negative	Long term	Significant	Reversible	• Should Protein Recovery Plant malfunction, processing would temporarily stop. Pipes from the

Activities/ Main Issue	Possible Impacts	Possible Impacts				Mitigation Measures
		Direction	Duration	Magnitude	Type	
Solid Waste from Poultry Processing and Protein Recovery Plant	• Odour					Processing Plant will be redirected to the divert valves so that pumping of biological waste takes place directly into trucks going to landfill. • Should the Protein Recovery Plant fail temporarily, stand-by trucking would be "on call" to collect biological waste for immediate removal to landfill. • The Protein Recovery Plant will be a closed loop negative pressure building system to eliminate vectors.
Reduction of biological waste sent to landfill	• Reduction in biological waste transported to landfill due to the introduction of the Protein Recovery Plant.	Positive	Long term	Major	Reversible	-
Human - induced hazards	The risk of technological hazards from the handling and storage of LNG Risks associated with daily transportation of LNG to the project site.	Negative	Long term	Major	Reversible	• It is important that pipelines, transporting vessels and storage systems for the natural gas be rated for zero leakage and designed as a closed system. Therefore, during operation of the facility there will be no leakages or spills of natural gas. The latest

Activities/ Main Issue	Possible Impacts	Possible Impacts				Mitigation Measures
		Direction	Duration	Magnitude	Type	
						equipment provides for suction of disconnected volume. Hence, with the installation of safety equipment, the quantity of these releases will be very small and within NEPA's specified limits and will quickly disperse with the wind. • Adequate and proper maintenance of all pumps, valves and pipelines must be ensured to limit any fugitive natural gas emissions within acceptable limits. • Air dispersion modelling indicated above will include investigation of LNG impact on the ambient air quality. • Methane is the main constituent of liquified natural gas (LNG). This gas is not harmful to human and animals but in large concentrations it carries significant environmental risk due to its flammability and green-house effect. NFE should ensure that the gas recovery system to condense evaporated gas and the systems for fire and gas detection

Activities/ Main Issue	Possible Impacts	Possible Impacts				Mitigation Measures
		Direction	Duration	Magnitude	Type	
						conform to industry best practices. • The training of staff to respond to system alerts and other emergencies should be ensured. The emergency response plan for the CB facility should incorporate procedures to deal with emergencies occurring on both the JPS and NFE properties. • Siting of the storage tanks should be considered with respect to risks from extreme events such as earthquakes and hurricanes. The topography of Hill Run makes it highly exposed to high winds as accompany hurricanes.
Natural Hazards and Climate Change	Due to the nature of geology and soils, the site is vulnerable to liquefaction as a result of earthquakes. Projected climate change impacts that are likely to affect the site as it includes more variable and intense periods of rainfall and more intense hurricanes. The site will be even more vulnerable to flooding.	Negative	Short to Long-term	Significant	Reversible	• The site should be elevated above the influence of the flooding from the Town Gully. In addition, the building should also be elevated. The interior of the building should also be designed in such a way that if flooding does affect the site, critical equipment will not be affected. They should be water proofed and raised. See section 5.1.1.2 and 5.1.1.3 for further measures.

Activities/ Main Issue	Possible Impacts	Possible Impacts				Mitigation Measures
		Direction	Duration	Magnitude	Type	
	Tropical Cyclones may cause wind damage					• It is important to note that there are differentiated risks associated with horizontally and vertically positioned tanks. Some consideration should be given to the use of horizontal LNG tanks since there is a greater risk posed by hurricanes and storms with high wind speeds to potentially negatively impact vertical tanks.
Reduction in greenhouse gas emissions	The use of LNG to run the power plant instead of fossil fuels will reduce the carbon footprint of the CB and JPS operations. LNG burns 50-60% less carbon dioxide and produces minute levels of Sulphur dioxide and particulate matter. Given Jamaica's energy policy and strategic direction, this reduction in greenhouse gas emissions is a positive move nationally.	Positive	Long term	Major	Reversible	
Ecology	Improper management of wastewater could encourage long term negative impacts downstream.	Negative	Long term	Major	Reversible	As indicated above this can be addressed through the proper treatment of effluent prior to any discharge into the Town Gully. Also, an EMP should be prepared for the

Activities/ Main Issue	Possible Impacts	Possible Impacts				Mitigation Measures
		Direction	Duration	Magnitude	Type	
						operation phase so that the appropriate monitoring of effluent is done.
Employment	The availability of jobs is one main positive impact anticipated from this development. During the operation phase approximately 130 to 150 jobs would be available to fill several areas including the processing plant, security, ancillary and office staff.	Positive	Long Term	Major	Reversible	-
Traffic	Currently, traffic in the area is very light but with the development an increase in vehicular movement anticipated during the operation phase. This increase is not expected d to result in congestion since the area is characterised by low density traffic.	Neutral	Long term	Minor	Reversible	-
Migration	Perceived and real employment opportunities will attract persons to the area in search of jobs. This may result in an increase in the number of persons living in the areas, but these workers	Neutral	Long term	Moderate	Reversible	-

Activities/ Main Issue	Possible Impacts	Possible Impacts				Mitigation Measures
		Direction	Duration	Magnitude	Type	
	will have minimal impacts on existing housing, water and other resources.					
Help achieve Jamaica's objective for import substitution	CB's processing technology and safety has improved and as such they will be producing a better and more efficiently produced chicken product. This results in a higher production of processed chicken thus helping to achieve Jamaica's objective for import substitution. This may also result in a potential increase in exports.	Positive	Short to Long term	Major	Reversible	-
Health risks	Potential emissions from the JPS power plant and CB's poultry processing plant, if left unmitigated, can pose a possible health risk for surrounding communities should the wind transport emissions to residential areas north and south of the site at different times of the day. This can result in persons developing respiratory illnesses.	Negative	Long term	Significant	Irreversible	It is therefore imperative that CB and JPS implement mitigation measures outlined above under Section 5.1.1.1 and 5.2.1.1.

10 IDENTIFICATION AND ANALYSIS OF ALTERNATIVES

10.1 No Action Alternative

The Consultants have identified only one possible alternative and that is a “NO PROJECT” alternative. This means that the site would remain under crop farming and no improvements would be made to the development. With no development, there would be no added benefit of increased employment to the economy. Is would also mean that further contributions to community development such as in the road network and drains in the area would not be encouraged and existing issues related to these matters would remain. No development would also mean there is no increased contribution to Jamaica achieving the objective for import substitution and potential increase in exports.

11 ENVIRONMENTAL MANAGEMENT AND MONITORING

Monitoring is important to reduce the negative environmental issues. If a permit is granted for the construction and operation of fish and meat processing at Fellowship Hall, Hill Run, St. Catherine, a full Monitoring Plan should be prepared and submitted for the approval of NEPA. This Monitoring Plan is expected:

- Comply with relevant legislation
- Ensure implementation of the mitigation measures provided
- Conform with any General or Specific Conditions of the environmental permit when received
- Guide long-term minimization of negative environmental impacts.

The following components need to be included:

1. Inspection protocol
2. Parameters to be monitored, which should include
    - Ambient air quality
    - Water quality
    - Noise
3. Construction monitoring
    - Worker health and safety
    - Disposal of solid waste
    - Disposal of hazardous material
    - Disposal of trade effluent
4. Materials handling and storage
5. Covering of haulage vehicles
6. Transportation of construction materials
7. Deployment of flaggers and signposting where appropriate
8. Storage of fines and earth materials

The Monitoring Plan should speak to the entire construction period, with monthly reporting.

It is not possible to prepare a full Monitoring Plan at this stage, given that fact that a permit has not yet been granted by NEPA. The Monitoring Plan will need to take into consideration all the necessary Terms and Conditions placed in the environmental permit issues by NEPA.

The Environmental Management Plan should also be prepared after the permit is issued and the general and specific terms and conditions are known. The Environmental Management Plan should take into account, but not be limited to the following aspects:

- Solid waste management
- Liquid waste management
- Resource efficiency
- Hazard materials management
- Accident and emergency response
- Environmental management systems

Other Management Plans that will be prepared based on the terms and conditions of any permits granted for this project include the following:

- Waste Management Plan
- Landscape Plan
- Emergency Response Plan

12 CONCLUSION AND RECOMENDATIONS

In conclusion, based on the findings of the environmental impact assessment, the Consultant's professional option is that the project, once the recommended mitigation measures are followed, are not likely to result in significant environmental impacts. Both positive and negative impacts were identified for this project. Of the 17 potential impacts identified for the operation phase 5 are positive impacts and 2 are neutral. All of the 9 potential impacts identified for the construction phase and 17 identified for the operation phase, can be mitigated and are largely reversible.

13 LIST OF REFERENCES

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14 APPENDICES

Appendix I – The Consulting Team

Name	Qualification	Role
Eleanor Jones	MA, Geography	Team Leader
Annmarie Goulbourne	MSc Forestry	Environmental and Social Analyst and Project Manager
Theresa Rodriguez-Moodie	PhD, Geography	Environmental Management Specialist
Ian Gage	P.E Civil Engineering	Project Engineer
Rashidah Khan-Haqq	MPhil, Environmental Chemistry	Environmental Chemist
Nicholas Vaughan	BSc, Marine Biology	Ecologist

TERMS OF REFERENCE

for an

ENVIRONMENTAL IMPACT ASSESSMENT

for the

PROPOSED CARIBBEAN BROILERS HYBRID GROWTH CENTRE "THE NEST": POULTRY PROCESSING PLANT

at

Fellowship Hall, Hill Run, St. Catherine

By

Caribbean Broilers Group

Prepared by: The National Environment and Planning Agency

Date: May 2018

Environmental Impact Assessment Report for the for construction and operation of fish and meat processing at Fellowship Hall, Hill Run, St. Catherine by Caribbean Broilers Group.

The Technical Report should include but not be limited to the following:

1) Executive Summary
2) Introduction
3) Policy, Legislation and Regulatory Consideration
4) Methodology and Approach
5) Project Description
6) Description of the Environment
7) Public Participation
8) Impact Identification and Analysis
9) Mitigation
10) Identification and Analysis of Alternatives
11) Environmental Management and Monitoring Plan
12) Conclusion and Recommendations
13) List of References
14) Appendices

The purpose of this document is to establish the Terms of Reference (TOR) for the Environmental Impact Assessment (EIA) for Caribbean Broilers Group**.** An EIA seeks to identify the impacts the proposed project is likely to have on the area in which the physical development will be carried out as well as the impact of the environment on the proposed development. It also outlines mitigation measures necessary to reduce the negative impacts of the project. The EIA will be prepared using a participatory approach involving key stakeholders. This TOR is specific to works that is to be conducted within the marine environment.

The EIA report must be produced in accordance with the agreed TOR issued by the National Environment and Planning Agency (NEPA) to Caribbean Broilers Group.

Where the need arises to modify the TOR, the required amendments/modifications are to be made and submitted to the Agency. Approval for the TOR must be obtained from the Agency, in writing, prior to the commencement of the EIA study.

The National Environment and Planning Agency and the Natural Resources Conservation Authority (NRCA) reserves the right to reproduce, transfer and disclose any and all contents contained in the submitted environmental impact assessment report without the written consent of the proponent, consultants and/or its agents.

The Terms of Reference to conduct the Environmental Impact Assessment (EIA) are as follows:

1) Executive Summary

Provide a brief statement on the content of the EIA report. The executive summary should provide a comprehensive overview and objectives of the project proposal, natural resources, justification for the project, etc. In addition, it should include relevant background information and provide a summary of the main findings, including but not limited to main impacts and mitigation measures, analyses and conclusions in the report.

2) INTRODUCTION

The introduction should provide a background and seek to explain the need for and the context of the project and the EIA. It should also provide the delineation and justification of the boundary of the study area, general methodology, assumptions and constraints of the study. Additionally, a profile of the project proponent, implementing organization, project consultants, etc. should also be provided. The study area shall include at least the area within a 1km radius of the boundaries of the proposed project area.

3) POLICY, LEGISLATION AND REGULATORY CONSIDERATION

This section should provide details of the pertinent regulations, standards, policies and legislations governing environmental quality, safety and health, cultural significant finds, protection of sensitive areas, protection of endangered species, siting and land use control at the local and national levels. The examination of the legislation should include at a minimum the Natural Resources Conservation Authority Act 1991, Natural Resources Conservation Regulations 1996, amended 2015, Natural Resources Conservation (Wastewater and Sludge) Regulations, 2013, Wild Life Protection Act, the Town and Country Planning Act 1957, National Solid Waste Management Authority Act, Building Act and Codes and Standards promulgated there under, Town and Country Planning (Saint Catherine) Provisional Development Order, 2017, Natural Resources Conservation Authority & Town and Country Planning Authority Guidelines for Developing a Natural Gas Sector Regulatory Framework 2015, The Public Health Act, Planning Guidelines and **all** appropriate international convention/protocol/treaty where applicable. Describe traditional land use and advise of any prescriptive rights including public access rights.

4) METHODOLGY & APPROACH

Clearly outline the methodologies and approaches in conducting the study including collecting and analyzing data, stakeholder consultation, dates on which surveys were conducted etc.

5) PROJECT DESCRIPTION

This section should provide a comprehensive description of the overall project concept and specify the different components. It should include the following:

- History and background of the project
- A location map at a scale of 1:12,500 (or an appropriate scale)
- A detailed site survey at a scale of 1:1250 showing all existing buildings, structures and ground levels (above Ordinance datum)
- The total area of the site.
- Existing site and its characteristics

- Description of the surrounding areas
- Site maps illustrating areas to be impacted and areas to be preserved in their existing state.
- A master site layout plan showing the various components and design elements of the proposed development
- A comprehensive description of all components and the various design elements of the project inclusive of project objectives and phases (where applicable), all applicable timelines for the various aspects of the project (from pre to post development). The description should also provide details of the design concept, design components, material(s) to be used, designated parking areas, total number and design of access (ingress/egress points) to the development from the main road; setbacks (from property boundaries, main road etc.), safety and security and supporting services. This should be supported by the use of maps, schematic plans, diagrams and other visual aids where appropriate.
- Details of proposed access(es) to the site to be used for pre-construction, construction and operational phases
- Details on infrastructure development including design plans for all components of the development including the proposed wastewater/sewage treatment system and disposal of treated effluent must be clearly outlined.
- details of a scheme for firefighting and emergency operations including:
    - Active protection (such as fire detection systems, sprinkler systems, automatic smoke extraction systems etc.)
    - Passive protection (the nature construction material used)
    - The means of escape
    - Emergency lighting and warning signs.
    - Evacuation
    - Dedicated Emergency access ways for the fire fighting and emergency.
- A comprehensive drainage assessment. This assessment should take into consideration existing natural drainage channels, proposed man-made drainage/water features or any proposed changes in topography. Potential issues of increased surface runoff and sediment loading must also be addressed. Special emphasis should also be placed on the storm water run-off, drainage patterns, characteristics of the aquifer, including the level and status of the groundwater. In addition, plans for providing utilities, particularly details relating to the source of potable water and electricity generation, roads and other services should be clearly stated.
- A landscape plan supported by the landscape design concepts and overall landscape framework, ground modeling (including the ground levels above Ordnance datum), the typical treatment to the proposed roads and footpaths.
- A Waste Management Plan which clearly outlines expected types and quantities of construction waste during the construction phase, general waste arising from material consumption of the workforce, as well as, the expected waste during the operational phase should be completed. Details should also be provided for any central disposal area(s) being considered to serve the proposed development
- Details of equipment and machinery to be involved, how these will be mobilized and areas to be used for storage of machinery and material should be clearly indicated.
- Details of workforce, including proposals for mobilization and accommodation should be indicated.

- All phases of the project should be clearly defined, the relevant time schedules provided and phased maps, diagrams and appropriate visual aids included in the Environmental Impact Assessment Report.
- The study area should be clearly delineated and referenced. Taking into account the types of resources located in the area and the magnitude of the associated impacts, the study area should be large enough to include all valued resources that might be significantly affected by the project.
- Details of any required decommissioning of the works and/or facilities.

6) DESCRIPTION OF THE ENVIRONMENT

A survey of the proposed development site should be conducted; taking into account the types of resources located in this area and the magnitude of the associated impacts. The study area should be large enough to include all valued resources that might be significantly affected by the project. The study area should be clearly delineated and referenced and the survey should be conducted for both the wet and dry seasons. This information will form the basis upon which impacts of the project will be assessed. The following aspects should be described in this section:

Physical Environment

This section should provide a complete description of the study area including geographical boundaries and methodologies used for the collection of baseline data. The description should include the following aspects of the environment:

- Topography, soil type, climate, drainage, geology (including but not limited to seismicity and faults), geomorphology of the site and hazard vulnerability including impacts on current landscape, aesthetic appeal and hydrology should be examined. Special emphasis should be placed on storm water runoff, drainage patterns. Percolation tests should also be conducted within the proposed study area.
- Water quality for any surface water feature in the vicinity of the development. Quality Indicators should include but not be limited to Nitrate, Phosphate, Faecal Coliform, Salinity and Total Suspended Solids.
- Climatic conditions and air quality in the area of influence including particulates
- Noise levels of the existing site and the ambient noise in the area of influence.
- Sources of existing pollution and extent of contamination.
- Availability of solid waste management facilities.
- Surrounding land uses.

Biological Environment

Description of terrestrial habitats, existing vegetation, flora and fauna surveys inclusive of a species list; commentary on the ecological health, function and value in the project area, threats and conservation significance. This should include:

- A detailed qualitative and quantitative assessment of terrestrial habitats in and around the proposed project sites and the areas of impact. This must also include flora and fauna surveys and should include species lists.

- A species list should be generated with special emphasis placed on rare, endemic, threatened, protected, endangered, invasive and economically or nationally important species. Migratory species should also be considered. There may be the need to incorporate micro-organisms to obtain an accurate baseline assessment. Identification and description of the different ecosystem types and structure including species dominance, species dependence, habitats/niche specificity, community structure and diversity, possible biological loss or habitat fragmentation ought to be considered. The assessment must be done according to internationally (scientific) acceptable standards and the provision of photographic inventory is preferred.

The field data collected should include, but not be limited to:

- Vegetation profile
- Species lists must be provided for each community
- A habitat map of the area

Carrying Capacity

The ecological carrying capacity of the site should be assessed

Natural Hazards

A risk assessment of the development in relation to the following must be undertaken

i. Tropical Storms, Hurricanes, Earthquakes
ii. Natural hazard risk assessment should take in account climate change projections.

Heritage

An assessment of artifacts, archaeological, and cultural features of the site should be undertaken. Where there is a need this should be conducted in collaboration with the Jamaica National Heritage Trust.

Socio-economic Environment

This section should provide details on the demography, regional setting, location assessment, current and potential land-use patterns (of neighbouring properties); description of existing infrastructure such as should be explored; and other material assets of the area. There should also be an assessment of the present and proposed uses of the site and surrounding areas including any land acquisition needs, any prescriptive or public access rights, and impacts on current users of the area during and post development. Effects on socio-economic status such as changes to public access and recreational use, impacts on existing and potential economic activities, public perception, contribution of development to national economy and development of surrounding communities.

A socio-economic survey to determine public perception of the project (both negative and positive) should also be completed and this should include but not be limited to potential impacts on social, aesthetic and historical/cultural values. This assessment may vary with community structure and may

take multiple forms such as public meetings or questionnaires. The methodology for conducting the survey should be included as the EIA report.

7) PUBLIC PARTICIPATION

This section should detail the results public perception surveys conducted. It should summarize the issues identified during the public participation process and how these have been addressed or incorporated in the Environmental Impact Assessment Report.

It should describe the public participation methods, timing, type of information provided and collected from public and stakeholder target groups. The sampling methodology employed must be appropriate for the population size and distribution, and must be weighted towards the communities/interest groups in closest proximity to the proposed development. The instrument used to collect the information must be included in the appendix. Stakeholder meetings should also be held to inform the public of the proposed development and the possible impacts and gauge the feeling/response of the public toward the development.

The issues identified during the public participation process should be summarized and public input that has been incorporated or addressed in the EIA should be outlined.

Public Meeting(s) should be held in accordance with the Guidelines for Conducting Public Presentation at a time and location signed off by the National Environment and Planning Agency (NEPA). A public meeting will be held to present the findings of the EIA once completed and submitted for consideration. All relevant documents are required to be made available to the public. In addition, any material change to the design of the project will require a further public meeting to be undertaken by the developer and all changes made to the document and project should be clearly outlined to the public.

8) IMPACT IDENTIFICATION AND ANALYSIS

A detailed analysis of the project components should be done in order to identify major potential environmental, health and safety impacts of the project. This section shall seek to distinguish between levels of impact, significance of impact (a ranking from major to minor/significant to insignificant should be developed), positive and negative impacts, duration of impacts (long term or short term or immediate), direct and indirect and impacts, reversible or irreversible impacts, long term and immediate impacts and identify avoidable impacts.

Cumulative impacts should also be evaluated taking into account previous developments and any proposed development immediately adjacent to the subject development The major concerns surrounding environmental, health, and safety issues should be noted and their relative importance to the design and implementation of the project indicated.

The extent and quality of the available data should be characterized, explaining significant information deficiencies and any uncertainties associated with the predictions of impacts. A major environmental issue is determined after examining the impact (positive and negative) on the environment and having the negative impact significantly outweigh the positive. It is also determined by the number and magnitude of mitigation strategies which need to be employed to reduce the risk(s) introduced to the environment. Project activities and impacts should then be ranked as major, moderate or minor, and presented in separate matrices for all the phases of the project (i.e. preconstruction, construction,

operational, and decommissioning/closure). The potential impacts may be subdivided into Physical Impacts, Biological Impacts and Socio-economic and Cultural Impacts.

All impacts should be listed, ranked and assessed, preferably in a single table.

The impacts to be assessed should include but not be limited to the following:

Physical Environment

- Impacts of construction activities such as site clearance, earthworks, geotechnical and engineering requirements and spoil disposal.
- Impacts of spills (such as oil and chemical spills)
- Impacts on Air Quality
- Impacts on Water Quality (pollution of potable, coastal, surface and ground water)
- Impacts on/of Climate Change
- Demands/requirements of the following must be quantified
    - Water Supply
    - Sewage Treatment and Disposal - Empirical data must be provided to show that the proposed sewage treatment facility has the capacity to remove the nutrients to meet the National Sewage Effluent Standards;
    - Wastewater Disposal
    - Trade Effluent Discharges
    - Solid Waste Disposal
    - Electrical Power (fossil fuels, wind, sun, wave and tidal)
    - Communications and other utility requirements
    - Transport Systems and supporting infrastructure required
- Operation and maintenance – waste disposal, site drainage, sewage treatment and disposal solution, and air quality;
- Impacts on visual aesthetics and landscape
- Noise
- Change in drainage pattern
- Carrying capacity of the proposed site
- Mal-odor

Biological Environment

This should include an assessment of the direct and indirect impacts of the project on the ecology of the terrestrial environment with emphasis being placed on rare, endemic, threatened, protected, endangered, invasive, and economically important species found. This should include habitat loss and fragmentation, loss of species and natural features due to construction and operation, and the impact of noise and vibration on fauna.

Natural Hazards

Potential impact of natural hazards (including hurricanes and earthquakes) and flooding potential

Heritage

Loss of and damage to: artifacts, archaeological, geological and paleontological features. An assessment of artifacts, archaeological, geological, paleontological and cultural features should be

undertaken. Where there is a need this should be conducted in collaboration with the Jamaica National Heritage Trust.

Socio-economic Environment

This should include effects on socio-economic status including changes in resource use, public access and recreational use; impacts on existing and potential economic activities; public perception; and the contribution of development to the national economy and development of surrounding communities. Socio-economic and cultural impacts to include land use/resource effects.

9) MITIGATION

This section should provide mitigation measures which should endeavour to avoid, reduce or remedy the potential negative impacts identified, while enhancing the positive impacts identified. Mitigation and abatement measures should be developed for each potential negative impact identified. Full details of the methods proposed to be employed in the implementation of these measures should be provided, including details on the scheduling/timelines, source of materials, location and responsible parties, where appropriate. Maps and diagrams should also be used to illustrate areas where mitigation measures are proposed to be implemented.

10) IDENTIFICATION AND ANAYSIS OF ALTERNATIVES

Alternatives to the proposed development or specific components and the potential environmental consequences of each proposed alternative, including the no-action alternative should be examined. These should be assessed according to the physical, ecological and socio-economic parameters of the site including the effects of climate change.

11) ENVIRONMENTAL MANAGEMENT AND MONITORING

Environmental Management Plan

An Environmental Management Plan should be developed which will detail the requirements for the construction and operational phases of the project. This should include, but not be limited to methodology, training for construction and operation staff, recommendations to ensure that the implementation of mitigation measures and long-term minimization of negative impacts.

Environmental Monitoring Plan

A draft Environmental Monitoring Plan should be included in the EIA. At the minimum the draft monitoring plan should include:

i. The locations selected for monitoring
ii. The mitigation measures to be implemented and the parameters and activities which will be monitored for each activity
iii. The proposed methodology to be employed for the monitoring of the various parameters The frequency of the monitoring
iv. The proposed format that the monitoring reports should take
v. The frequency of the submission of the monitoring reports
vi. The responsible parties for the monitoring
vii. Details for special monitoring of sea turtles, birds and crocodiles during and after the proposed works

12) CONCLUSION AND RECOMMENDATIONS

13) LIST OF REFERENCES

14) APPENDICES

The appendices should include but not be limited to the following documents:

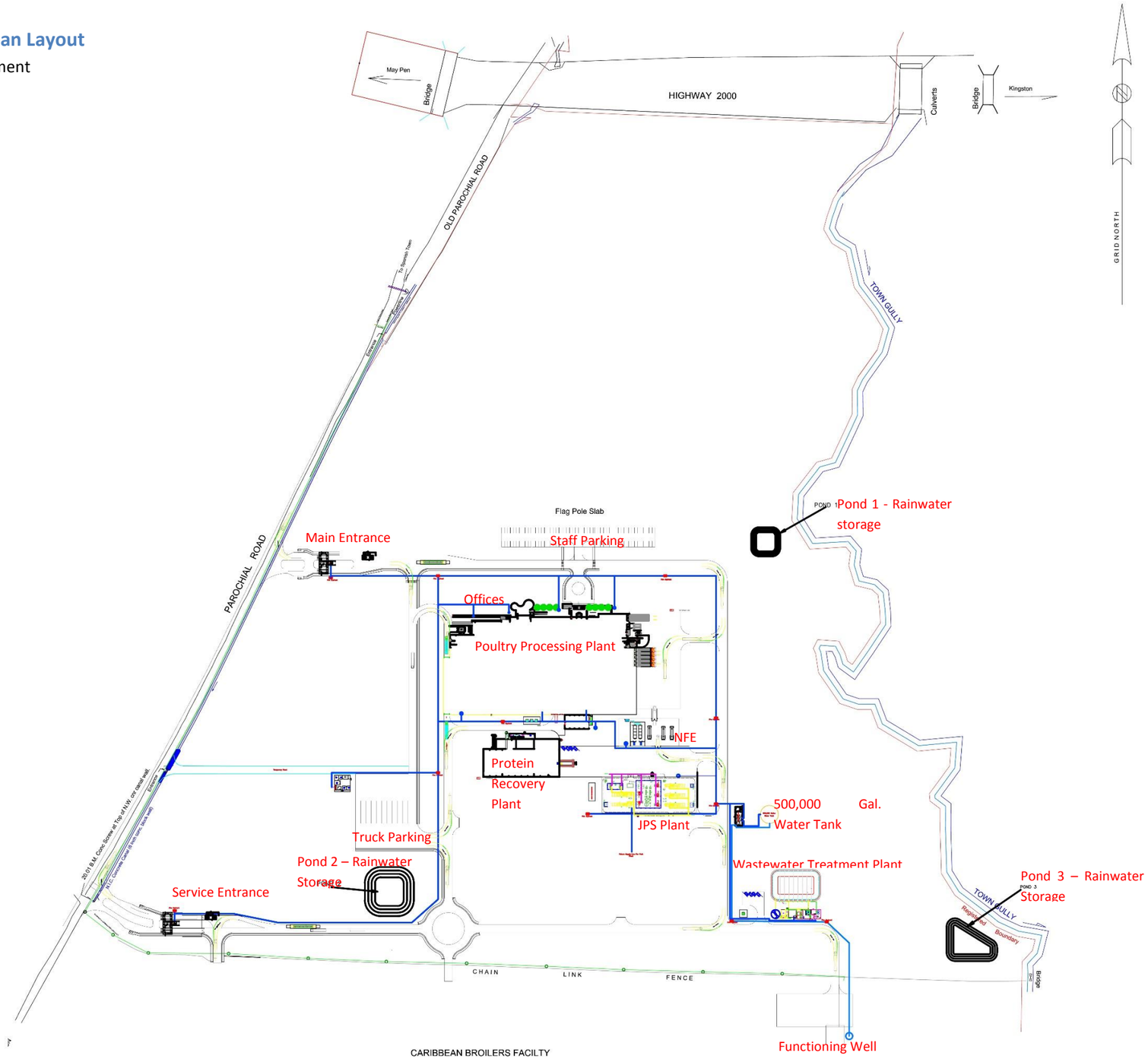
i. Reference documents
ii. Photographs/ maps
iii. Data Tables
iv. Glossary of Technical Terms used
v. Final Terms of Reference
vi. Profile of the project proponent and implementing organization
vii. Composition of the consulting team, team that undertook the study/assessment, including name, qualification and roles of team members
viii. Notes of Public Consultation sessions
ix. Instruments used in community surveys

All findings must be presented in the EIA report and must reflect the headings in the body of the TORs, as well as, references. GIS references should be provided where applicable. One hard copy and an electronic copy must be submitted to NEPA for review after which the Agency will indicate the number of hard copies along with an electronic copy of the report to be submitted. One copy of the document should be perfect bound.

The report should include appendices with items such as maps, site plans, proposed streetscapes (that will demonstrate the preservation of the windows to the sea concept from the roadway), the study team and their individual qualifications, photographs, and other relevant information. All of the foregoing should be properly sourced and credited.

Appendix III – Master Plan Layout

Also Attached as a pdf document



CARIBBEAN BROILERS FACILTY

Master Plan Layout

Appendix IV – Interview Questions and Observation Sheets

COMMUNITY INTERVIEWS & KEY INFORMANTS

DEMOGRAPHIC DATA

1. Would you say it is mainly a community of young, middle aged or old people?

2. What are the proportions of children under 18, young people 18-35, middle-aged people 36-59 and seniors 60 years and older?

3. What is the average family size?

4. What proportion of families are headed by females?

LAND USE AND LIVELIHOODS

5. What are the main things that people around here do to earn a living?

6. Can you name them in order of importance?

7. How is the land used: small farms, plantation agriculture, fishing, forestry, bush-land, idle land, charcoal, housing, commercial activity, industrial activity, tourism etc.

8. What crops are grown here?

9. Are there any tourism activities in the area? Does the community directly benefit from them?

WATER CONSUMPTION

10. Where do the people get water from for use in their homes? (River, piped into yard, tank/rain water, trucked, etc.)

11. Where do the commercial and industrial enterprises get water from?

12. Is the water supply adequate and reliable? Tell us about the water service.

THE PROJECT:

13. Have you heard about the PROJECT?

14. How do you feel about the project?
    i. Badly needed
    ii. Quite necessary
    iii. Necessary
    iv. Not too needed/Don't know
    v. Not necessary

How do you feel about the Project in relation to your community?

_____

IDENTIFY MAIN FEARS:

- Construction Debris/Dust
- Human Health
- Animal Health
- Flooding
- Environmental damage to the area
- Sewage & solid waste issues
- Odour
- Other

IDENTIFY MAIN BENEFITS:

- Employment
- Overall development
- Better roads
- Improve drainage
- More entertainment
- Electricity
- Others

PUBLIC HEALTH & SAFETY

15. What types of sanitary conveniences are used in the community and about how many use each type? (WC linked to sewage system, WC linked to run-off pit, pit latrine, etc.)

16. Are there persons who have no sanitary conveniences?
17. Is the river/gully ever used for this purpose?

18. How is garbage stored and disposed of in this community?

19. Does the garbage truck come regularly?

20. Is the river/gully ever used to dispose of garbage?

DEVELOPMENTS UNDERWAY

21. Do you know of any new developments that are presently underway in this area or that should soon be coming on stream? (Housing scheme, road construction/repairs, commercial/industrial construction, social facilities, Govt. project, etc.) Please list them.

22. Do you think the Project and the new developments will get in the way of each other in any way?

23. How disruptive do you think the work will be?
    1) Very disruptive [ ] 2) Disruptive [ ] 3) Not very disruptive [ ]

FLOOD EXPERIENCE

24. Does this community have a problem with flooding? Explain how and how often this has occurred in the past and the kind of damage experienced.

_____

COMMUNITY _____ Name(s) of Resp._____

Role._____

WINDSCREEN OBSERVATION

Hill Run, St. Catherine

Date of Observation: __17__ /__01__/ 18___

Community: _____

Element(s) of Project Planned _____

Physical Characteristics of area (topography, vegetation, land management):

_____

_____

Type of Community: 1) Unplanned Residential [ ] 2) Planned Residential [ ]

3) Housing Schemes [ ] 4) 5) Squatter [ ]

Socio-economic classification: 1) Upper [ ] 2. Middle [ ] 3. Lower [ ]

Land-use & livelihoods: 1) Agricultural [ ] 2) Commercial [ ] 3) Industrial [ ]

4) Residential [ ]

Civic Amenities 1) Clinic [ ] 2) Basic School [ ] 3) Other Schools [ ]

4) Police [ ] 5) Church [ ] 6) Market [ ]

Developments Underway:_____

Evidence of Growth in Housing Stock Yes [ ] No [ ]

Evidence of growth of Unplanned Dev Yes [ ] No [ ] or Squatting Yes [ ] No [ ]

Explain _____

Water source & storage: _____

Waste management: _____

Flood Prone Indicators Yes [ ] No [ ] _____

Proximity to Paradise Park project site:

1. Within estate area [ ] 2. On the margin [ ] 3. Outside of the area [ ]

Likely to have a direct or indirect impact by the operations occurring at Hill Run on both community and site and vice versa

(examine potential impacts during construction or operations)

_____

What indications?

_____

_____

Of likely interest to team remain planning issues being investigated (drainage water, traffic, waste disposal etc.).

_____

Other Socio Econ features/observations: _____

Other Issues Mentioned by Team.

_____

_____

Contact Names Taken: _____

ESL Observers: _____ & _____ & _____

Appendix V - List of Persons Consulted

HILL RUN, ST. CATHERINE

STAKEHOLDER CONSULTATION REGISTER

COMMUNITY NAME Hill Run Spanish Town

	NAME	COMMUNITY	CONTACT NUMBER
1	Karl Lewis	Hill Run	538-7893
2	Dennis Nelson	Hill Run	373-7564
3	Christopher Walker	Hill Run	822-0051
4	Sonia Munroe	Hill Run	376-4435
5	D Brown	Hill Run	376-4435
6	Vincent Sutherland	" "	897-8518
7	Mrs Sutherland	" "	541-4698
8	Michael James	Hill Run	599-2510
9	Shane Morrison		532-5738
10	Carlton James		813-4918
11	Andrew Foster	Hillrun	454-0434
12	Nicholas Scott		443-9912
13	John Campbell	Hill Run	512-3404
14	Rohan Watson	" "	375-5309
15	Kay Bartlett	" "	276-4285
16			
17			

HILL RUN, ST. CATHERINE

STAKEHOLDER CONSULTATION REGISTER

COMMUNITY NAME Cromarty, Windsor Road & Duncans Pen

	NAME	COMMUNITY	CONTACT NUMBER
1	Everith Henry	Cromarty	450-5102
2	Enid Walker	Cromarty	850-3062
3	Joylett Stewart	✓	669-9337 770 4282
4	Fabian Francis	Dakota Farms	899-7545
5	Patricia Mahoney	Sgt Fellowship Hall	618 2404
6	George Barnes.	Duncans Pen	770-1732
7	Margaret Brown	20 Duncan Pen Road.	365 0342 377 0471
8	Hyacinth Brown	2A Duncan Pen Rd	3737483
9	Stephen Robinson	37 Windsor Rd	346 2279
10			
11			
12			
13			
14			
15			
16			
17			

10 people Refused to sign from Windsor Road.

Appendix VI - Sample Survey Questionnaires Completed

FW. NO_____ **COMMUNITY QUESTIONNAIRE** Quest #_____

RE CARIBBEAN BROILERS EIA- HILL RUN

Community Name: Hill run **Interviewed Persons Name:** Doran Johnson

Contact # 793-3029

The Project Concept (external sheet) [3 main activities - Poultry Processing, JPS Power Plant, LNG Storage]

1. Do you think that this concept would meet the approval of your community?

1.☐ Highly approved 2.☑ Approved 3.☐ Not highly approved 4.☐ Not approved

If 3 or 4 probe for reasons_____

2. Do you perceive that the community views this Project as being:

1.☐ Very Necessary 2.☑ Necessary 3.☐ Not Very Necessary 4.☐ Unnecessary

3. If 3 or 4 please probe for reasons_____

4. Please identify any specific fears or reservations your fellow community members may have about the Project

The odor

5. Please identify the main **benefits** you see arising for your community from the project.

Road lighting & Community centre Development

6. What would be the main environmental concerns that the community would have regarding the project Disposal of waste water

7. What alternative land use do you think the community would prefer for the intended project site, if any? None ☑ or _____

8. What do you think your community can offer to the project?

We can our assistance

Thank You !

FW. NO_____ **COMMUNITY QUESTIONNAIRE** Quest #_____

RE CARIBBEAN BROILERS EIA- HILL RUN

Community Name: Fellowship Hall **Interviewed Persons Name:** Fabian Francis
Contact # 293-3499

The Project Concept (external sheet) [3 main activities - Poultry Processing, JPS Power Plant, LNG Storage]

1. Do you think that this concept would meet the approval of your community?

1.☐ Highly approved 2.☐ Approved 3.☑ Not highly approved 4.☐ Not approved

If 3 or 4 probe for reasons_____

2. Do you perceive that the community views this Project as being:

1.☐ Very Necessary 2.☐ Necessary 3.☑ Not Very Necessary 4.☐ Unnecessary

3. If 3 or 4 please probe for reasons The smell Sometimes from over there is unbearable

4. Please identify any specific fears or reservations your fellow community members may have about the Project
The odour from CB is unbearable already so if a plant go nearby · it will be really bad for the business nearby.

5. Please identify the main **benefits** you see arising for your community from the project.
person will get work from the project

6. What would be the main environmental concerns that the community would have regarding the project the smell and ~~disposable of~~ burning of dead chicken

7. What alternative land use do you think the community would prefer for the intended project site, if any? None ☑ or _____

8. What do you think your community can offer to the project?

Thank You !

FW. NO_____ **COMMUNITY QUESTIONNAIRE** Quest # 8
RE CARIBBEAN BROILERS EIA- HILL RUN

Community Name: Cramarty **Interviewed Persons Name:** Bigs
Contact # _____

The Project Concept (external sheet) [3 main activities - Poultry Processing, JPS Power Plant, LNG Storage]

1. Do you think that this concept would meet the approval of your community?

1.☐ Highly approved 2. ☑ Approved 3. ☐ Not highly approved 4.☐ Not approved

If 3 or 4 probe for reasons _____

2. Do you perceive that the community views this Project as being:

1.☑ Very Necessary 2. ☐ Necessary 3. ☐ Not Very Necessary 4.☐ Unnecessary

3. If 3 or 4 please probe for reasons _____

4. Please identify any specific fears or reservations your fellow community members may have about the Project
Fear of waste harming the community
Gas giving off raddiation and may cause poision.
Nepa need to revist the Natural gas.

5. Please identify the main **benefits** you see arising for your community from the project.
People will be getting easy supply for Chicken which will increase farmings should improve roadway and employment
~~but~~ we welcome the project to the area to provide employment.

6. What would be the main environmental concerns that the community would have regarding the project Pollution should be controlled

7. What alternative land use do you think the community would prefer for the intended project site, if any? None ☑ or _____

8. What do you think your community can offer to the project?
We know how to rear chickens and students can contribute to their production methods, Security.

Thank You!

FW. NO_____ COMMUNITY QUESTIONNAIRE Quest # 4
RE CARIBBEAN BROILERS EIA- HILL RUN

Community Name: ~~Hill Run~~ Cromarty Interviewed Persons Name: Haze/ Scarlette
Contact # _____

The Project Concept (external sheet) [3 main activities - Poultry Processing, JPS Power Plant, LNG Storage]

1. Do you think that this concept would meet the approval of your community?

1.☐ Highly approved 2. ☑ Approved 3. ☐ Not highly approved 4.☐ Not approved

If 3 or 4 probe for reasons_____

2. Do you perceive that the community views this Project as being:

1.☑ Very Necessary 2. ☐ Necessary 3. ☐ Not Very Necessary 4.☐ Unnecessary

3. If 3 or 4 please probe for reasons_____

4. Please identify any specific fears or reservations your fellow community members may have about the Project
Fear of the smell that the project would bring

5. Please identify the main **benefits** you see arising for your community from the project.
Job opportunity for the community

6. What would be the main environmental concerns that the community would have regarding the project The smell the project may bring

7. What alternative land use do you think the community would prefer for the intended project site, if any? None ☑ or _____

8. What do you think your community can offer to the project?
Labour

Thank You !

FW. NO_____ **COMMUNITY QUESTIONNAIRE** **Quest #**_____
RE CARIBBEAN BROILERS EIA- HILL RUN

Community Name: Dunlop's Pen **Interviewed Persons Name:** [illegible]
Contact # _____

The Project Concept (external sheet) [3 main activities - Poultry Processing, JPS Power Plant, LNG Storage]

1. Do you think that this concept would meet the approval of your community?

1.☑ Highly approved 2. ☑ Approved 3. ☐ Not highly approved 4.☐ Not approved

If 3 or 4 probe for reasons _____

2. Do you perceive that the community views this Project as being:

1.☑ Very Necessary 2. ☑ Necessary 3. ☐ Not Very Necessary 4.☐ Unnecessary

3. If 3 or 4 please probe for reasons _____

4. Please identify any specific fears or reservations your fellow community members may have about the Project

No fear or reservations

5. Please identify the main **benefits** you see arising for your community from the project.

Employment, Community Development

6. What would be the main environmental concerns that the community would have regarding the project Air Pollution

7. What alternative land use do you think the community would prefer for the intended project site, if any? None ☑ or _____

8. What do you think your community can offer to the project? Labour

Thank You !

FW. NO_____ COMMUNITY QUESTIONNAIRE Quest #_____
RE CARIBBEAN BROILERS EIA- HILL RUN

Community Name: Windsor Road **Interviewed Persons Name:** Rose-marie.
Contact # 328-2131

The Project Concept (external sheet) [3 main activities - Poultry Processing, JPS Power Plant, LNG Storage]

1. Do you think that this concept would meet the approval of your community?

1.☑ Highly approved 2. ☑ Approved 3. ☐ Not highly approved 4.☐ Not approved

If 3 or 4 probe for reasons_____

2. Do you perceive that the community views this Project as being:

1.☐ Very Necessary 2. ☑ Necessary 3. ☐ Not Very Necessary 4.☐ Unnecessary

3. If 3 or 4 please probe for reasons_____

4. Please identify any specific fears or reservations your fellow community members may have about the Project
No specific fear in particular

5. Please identify the main **benefits** you see arising for your community from the project,
Job creation (e.)

6. What would be the main environmental concerns that the community would have regarding the project no concern

7. What alternative land use do you think the community would prefer for the intended project site, if any? None ☑ or _____

8. What do you think your community can offer to the project? Support

Thank You!

Appendix VII – Water Quality Results by Parameter

Nitrate and Ammonia

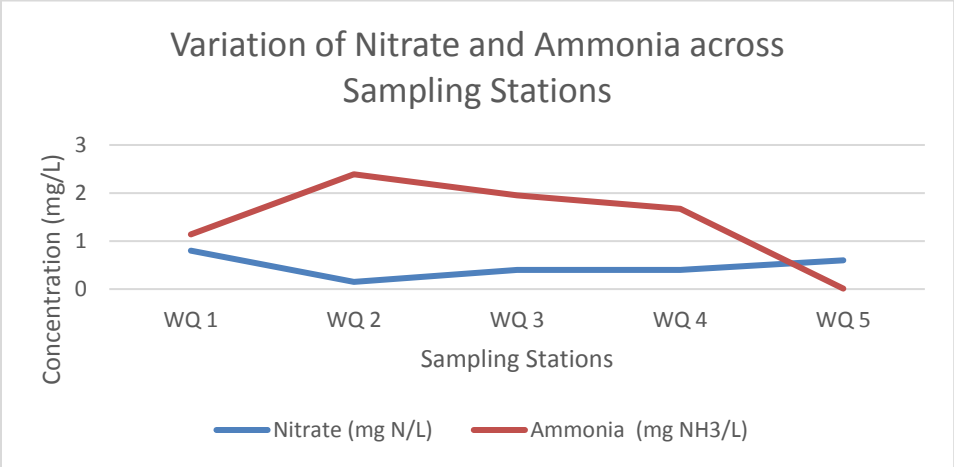


Figure: Changes in Nitrogen Species Concentrations

Nitrogen is a component of protein and is therefore essential to all life. Both ammonia and nitrates are indicators of contamination by anthropogenic sources such as wastewater from sewage discharge and/or fertilizers from agricultural land runoff. Both compounds are also a part of the nitrogen cycle where ammonia can be converted to nitrates in a process called nitrification and nitrates converted to ammonia in the process of denitrification.

There is a general decrease in ammonia concentrations from WQ 2 to WQ6 while the opposite is true for nitrates for the same locations. The trend of both graphs is also expected because both nitrates and ammonia are critical starting materials of both the denitrification and nitrification processes respectively. We can therefore assume that moving from sampling point 2 to 5 along the gully, ammonia is being consumed while nitrate is being formed. Despite the gradual increase in nitrates concentrations, however, the levels remain complaint with the NRCA Ambient Water Standard for all the sampling site.

Phosphate

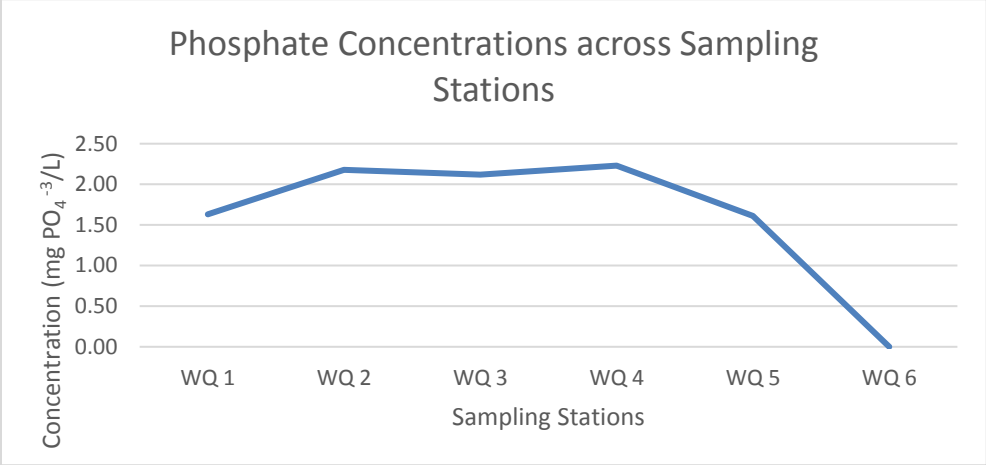


Figure: Changes in Phosphate Concentration

The Town Gully is used not only by the NIC but also as a receptor for surface runoff and drains from roads, industrial and commercial sites. The elevated phosphate levels are therefore most likely due to anthropogenic influences.

Alkalinity

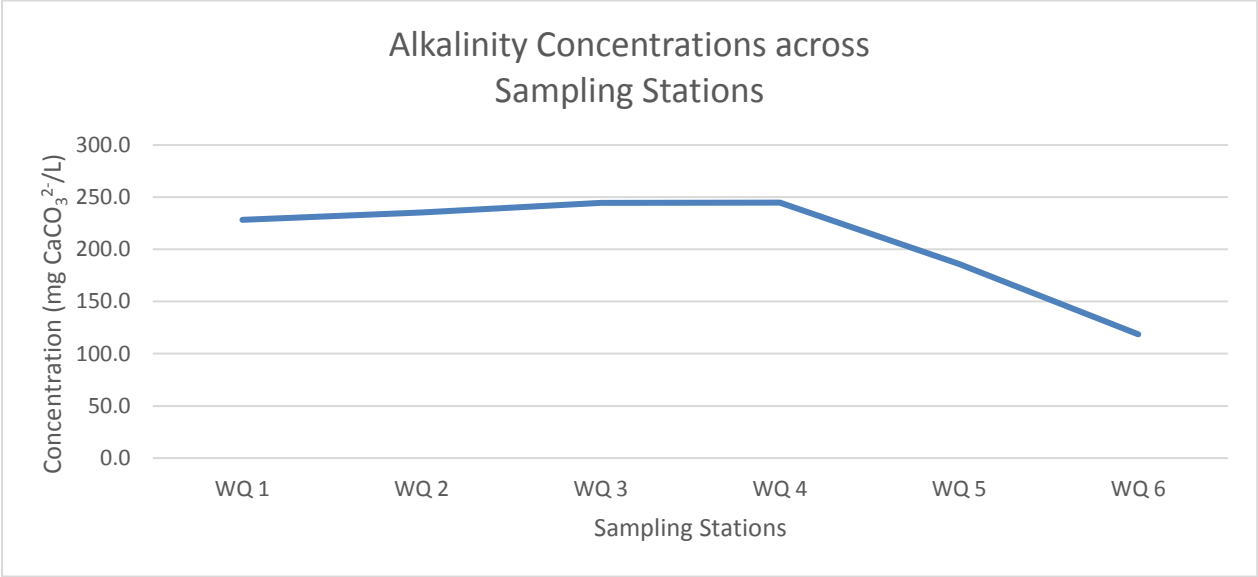


Figure: Changes in Alkalinity

Alkalinity refers to the buffering capacity or the ability of a water body to resist acidification. In general, the alkalinity of the water in the town characterises it as not being at risk for acidification (>20mg/L). The Alkalinity within the Town Gully generally remains consistent except for the concentration measured at WQ 5 where it began trending down. This decrease in alkalinity at this point suggests an inflow into the

Town Gully between sampling points WQ 4 and WQ5. Further investigation to determine the location and eventual characterization of this inflow is recommended to prevent during deterioration of this water system given its importance to the aquaculture farmers downstream.

The low alkalinity level of WQ 6 indicates the influence of surface run off with low pH into this system. The quality of this water should be carefully monitored to prevent any adverse effects to the users downstream.

pH and Dissolved Oxygen

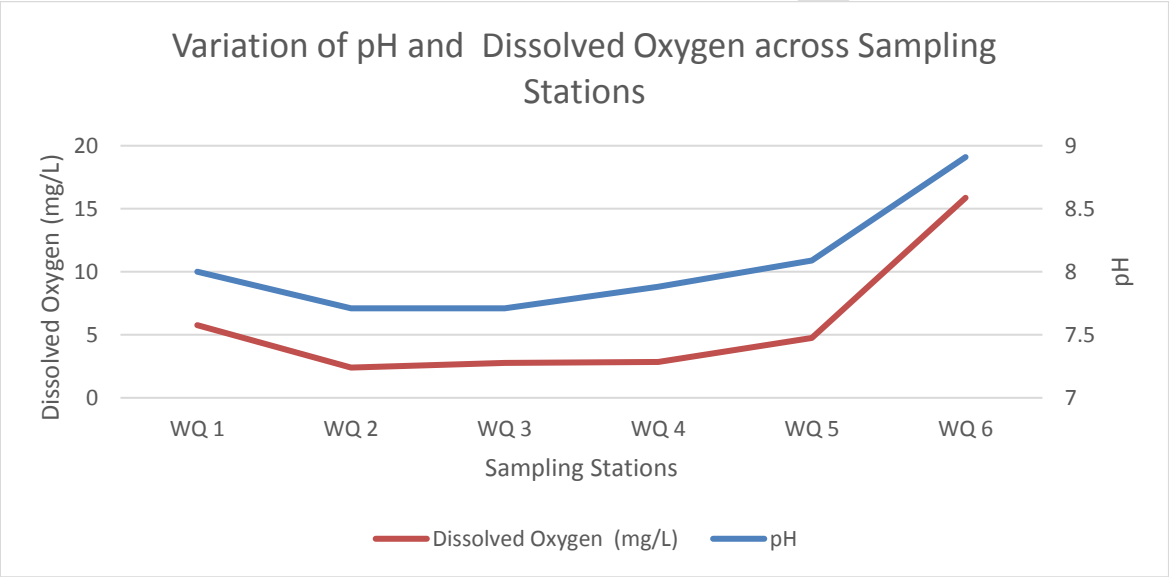


Figure: Variations in pH and Dissolved Oxygen across sampling site

The dissolved oxygen levels varied along the length of the Town Gully. Dissolved oxygen (DO) levels indicate the potential of a system to sustain aquatic life and degrade organic matter. The levels measured at WQ 2-4 were lower than the other sampling sites. The water at these sampling sites were deeper and flowing more slowly than the others. The rate at which oxygen dissolves in the water will therefore be slower than in water flowing at a faster speed. The BOD levels were also higher at these sampling stations indicating the presence of organic matter being degraded by microorganisms. This process of organic process requires dissolved oxygen. The high DO level measured at WQ 6 is influenced by the shallow fast-moving waters in the canal which is filled with aquatic plants. The time of day the sample was taken will also influence the DO level measured. The level of photosynthesis occurring within aquatic plants would be high. Oxygen is a by-product of this process.

The pH levels were within the NRCA Ambient Standard for all sampling stations except WQ 5 and 6. It is suspected that these stations are influenced from inflows of a trade effluent nature. Further investigations are needed to confirm this.

Total Coliform, Faecal Coliform and E.coli

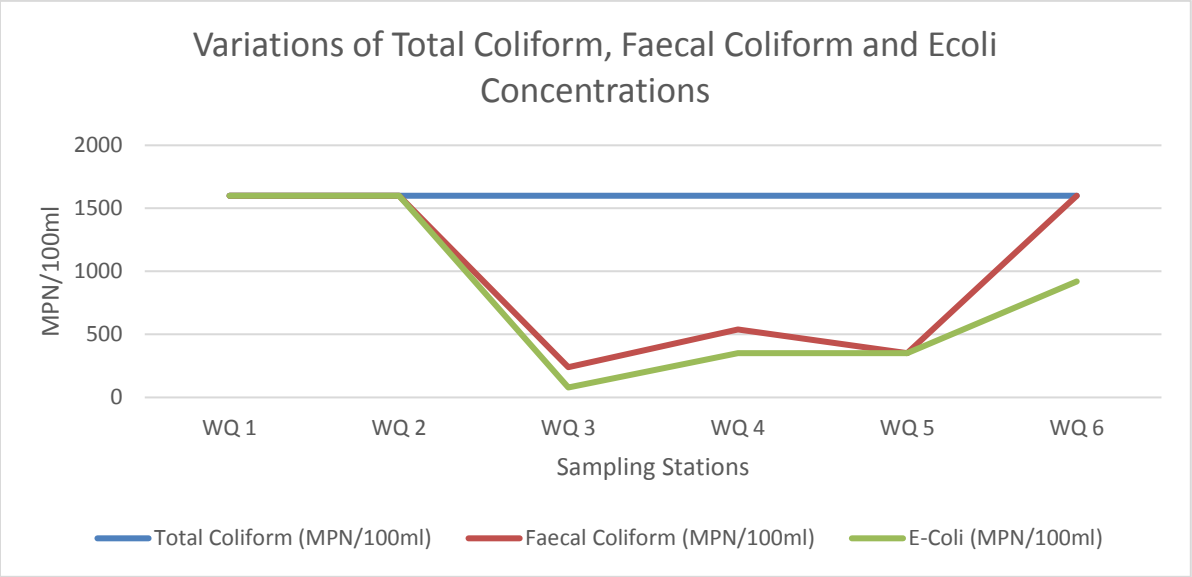


Figure: Variations in Total Coliform, Faecal Coliform and E. coli across sampling site

Total coliform are bacteria which lives naturally in the environment and within human and animal waste. Faecal coliform and E.coli are a subgroup of these bacteria which specially lives in the gut of warm blooded animals. Their presence indicates contamination by human and/ or animal waste.

Faecal coliforms and E. coli were present in all the samples tested, indicating the contamination of these water systems by human and or animal waste.

Turbidity and TSS

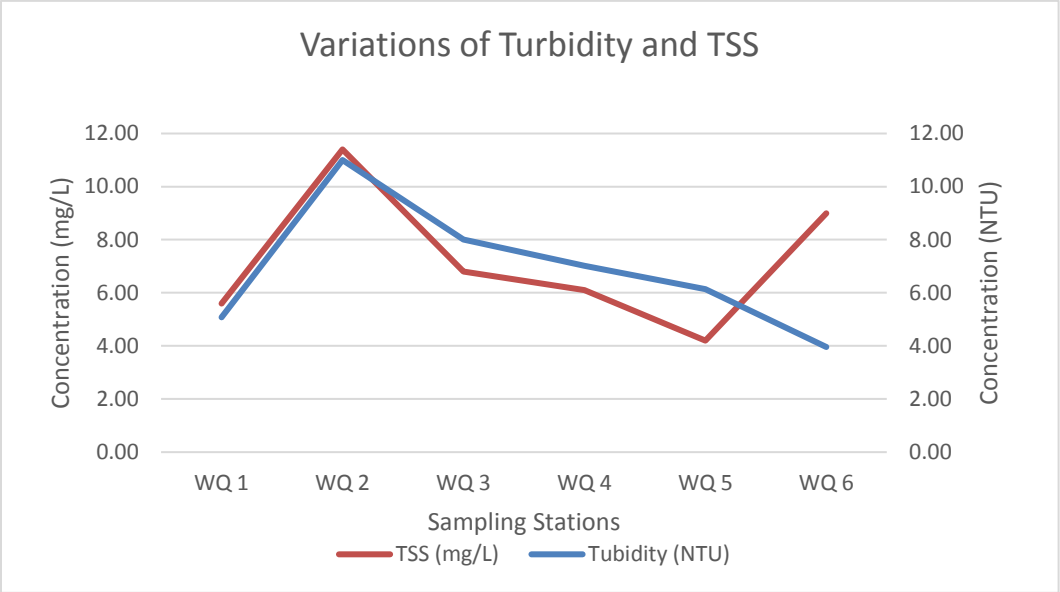


Figure: Variations in Turbidity and TSS across Sampling Sites

The total suspended solids (TSS) and turbidity are parameters which are critical to dissolved oxygen, and temperature of a water system and the ability of a system to sustain life. Waters high in TSS will clog the gills of fish and prevent the penetration of sunlight through the water column affecting photosynthesis in aquatic plants which will also affect DO. Surface run off from unpaved and/or un-grassed areas or the discarding of garbage and other debris will increase the sediment loading and suspended matter within these systems. Domestic garbage, dead plants and other debris was observed on both water systems. The silty bottom of the Town Gully and shallow (0.5 to 2 feet) waters may also influence the levels of TSS and turbidity measured.

Salinity

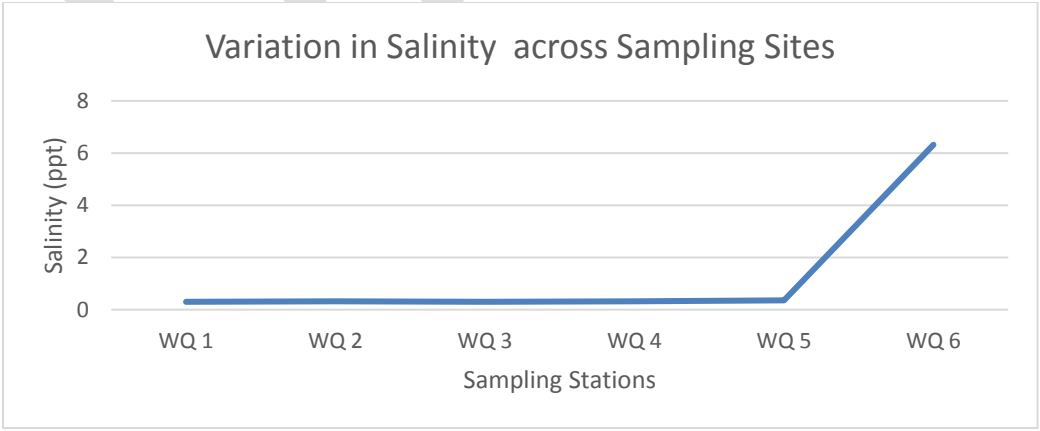


Figure: Variation of Salinity across Sampling Stations

Salinity measurements were typical for fresh water systems (0.0 -0.5 ppt) for all sampling sites except the NIC canal where the salinity level (6.32 ppt) indicating the water is brackish. The discharge of effluent in the system high in dissolved solids will contribute to the high salinity values. The water in the irrigation canal had elevated levels of sodium, chloride and sulphate compared to the other sites, indicating an external influence possibly, discharge of trade effluent. Using water with high salinity for irrigation purposes will affect soil quality as well metal machinery used in the field and hence crops. The quality of water in the NIC canal should be monitored constantly or placed through a monitored treatment system if it is to be used by the Client to prevent adverse impacts to their operations.

Metals

Potassium

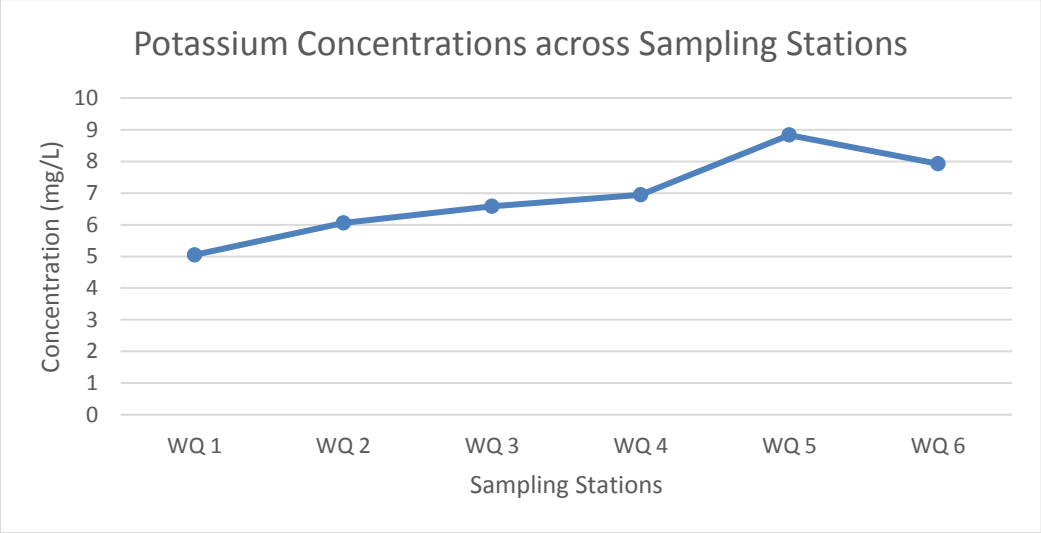


Figure: Potassium Concentration across Sampling Sites

There is a general increase in the potassium concentrations from WQ 1 to WQ 5 with the highest concentration measured at WQ5. Surface run off from land used for agronomy where fertilizers rich with potassium will contribute to the elevated potassium levels measured. Catching surface run off from cultivated lands and reusing it to irrigate the said lands may reduce the cost required to fertilize and irrigate such fields.

The potassium concentration at WQ6 was slightly below the concentrations at WQ5. In impact of industrial/ commercial site discharge is suspected on this canal.

Sodium

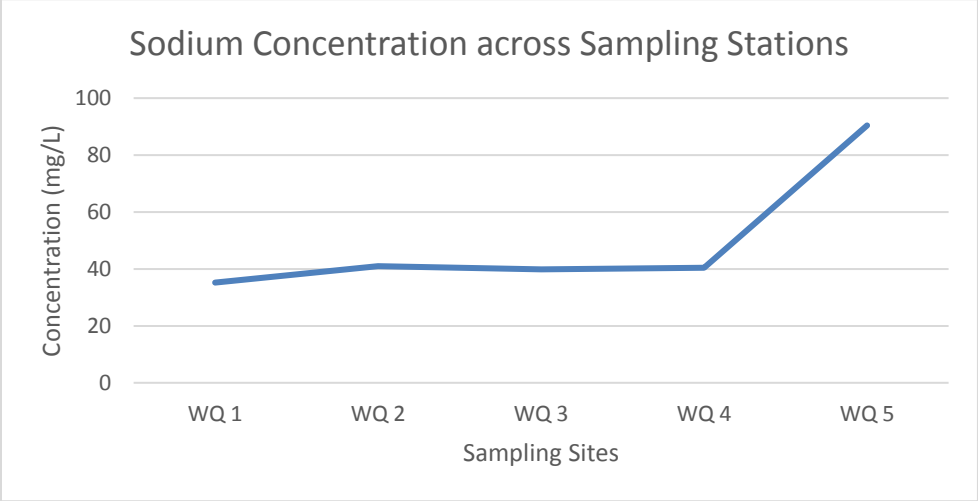


Figure: Variation of Sodium Concentration across Sampling Sites

The trend in the sodium concentrations indicates the sampling sites WQ1 to WQ4 sodium levels were generally the same. The highest sodium concentration was measure at WQ 6 where measured level was approximately twenty-seven (27) times higher than the second highest sodium concentration (WQ 5 90.4 mg/L). The influence of industrial/ commercial discharge on these sampling sites is again suspected. Continued monitoring of this parameter is recommended especially at WQ6 to prevent adverse impacts on soils and machinery.

The concentration of the remaining metals except for iron and zinc, were below the detection level of the method used to analyse the samples indicating an absence or minute levels of these parameters.

Appendix VIII – Species List

Flora species list for proposed site including 500m radius around project site

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE
Acacia sp.		Occasional
Musa sp.	Banana	Rare
Samanea saman	Guango	Occasional
Mangifera indica	Mango	Rare
Cocos nucifera	Coconut	Rare
Blighia sapida	Ackee	Rare
Prunus dulcis	Almond	Rare
Zea mays	Corn	N/A – Agricultural crop
Capsicum annuum	Sweet Pepper	N/A – Agricultural crop
Allium cepa	Onion	N/A – Agricultural crop
Rumex acetosa	Sorrel	N/A – Agricultural crop
Gossypium sp.	Cotton	N/A – Agricultural crop
Lasiacis divaricta	Small cane	Frequent
Ipomoea sp.		Abundant
Passiflora suberosa	Passionflower	Occasional
Panicum maximum	Guinea grass	Abundant
Leucaena leucocephala		Occasional
Lantana camara	White-sage	Frequent
Croton linearis		Rare
Sporobolus sp.	Smut grass	Abundant
Sida acuta	Wireweed	Frequent
Andropogon sp.	Beard grass	Frequent

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE
Cynodon dactylon	Bermuda grass	Dominant
Paspalum sp.	Biscuit grass	Frequent
Cyperus spp.		Abundant
Bidens pilosa		Abundant
Rivina humilis	Poke weed	Frequent
Commelina diffusa	Spiderwort	Abundant
Hylocereus Triangularis *		Rare

* - Endemic Species

Fauna species list for proposed site including 500m radius around project site

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE
BIRDS		
Ardea alba	Egrets	Abundant
Pandion haliaetus	Osprey	Rare
Psittaciformes	Green Parrot	Occasional
Cathartes aura	John Crow	Occasional
INSECTS		
Apis mellifera	Honey Bee	Occasional
Musca domestica	Fly	Occasional
Battus polydamas	Gold rim swallowtail	Rare
Heliconius charitonius	Zebra butterfly	Rare
Eurema spp.	Little Sulphur	Occasional
Spodoptera exigua	Beet armyworm	Abundant
Coleomegilla cubensis	Ladybird Bug	Occasional
Ascalapha odorata	Duppy Bat	Rare
REPTILES		
Anolis grahami	Graham's anole	Occasional