

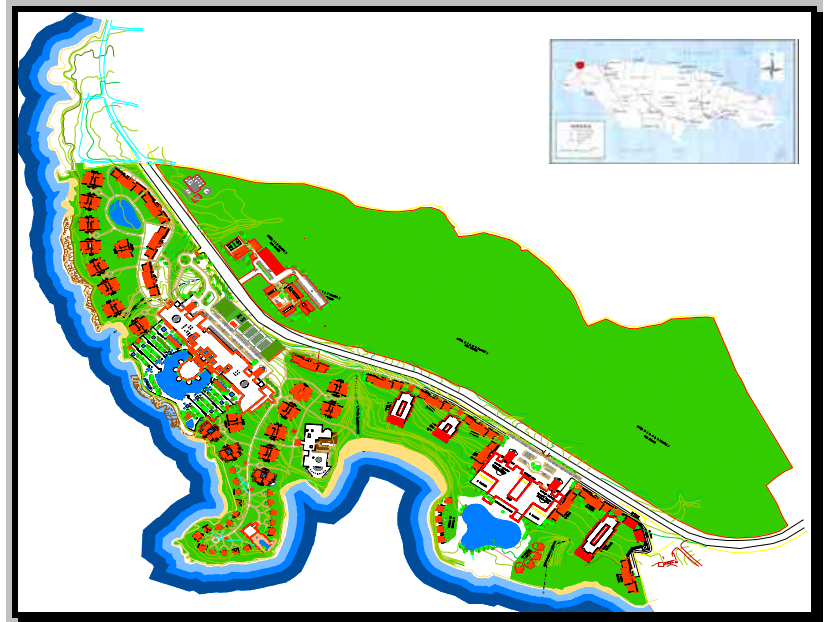
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# ENVIRONMENTAL IMPACT ASSESSMENT



FOR

## GRAND PALLADIUM LADY HAMILTON RESORT & SPA AT POINT, HANOVER

For:



Fiesta Hotel Group

**December 2005**

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# **EXECUTIVE SUMMARY**



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## **EXECUTIVE SUMMARY**

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### ***INTRODUCTION***

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FIESTA Jamaica Limited proposes to construct a 2000 room hotel on 80.9 hectares (200 acres) of land located at Point, Hanover. An Environmental Impact Assessment (EIA) of the project was conducted by Environmental Science and Technology Limited (ESTECH), to provide a complete description of the existing site, detail the elements of the development, identify major environmental issues, and report on public perception.

The EIA seeks to identify those activities of the project, which could have an adverse effect on the environment, and to determine means of avoiding the adverse consequences identified as well as to identify the positive or beneficial impacts.

This project includes benefits such as employment opportunities, foreign exchange earnings, increased property values and benefits to ancillary supporters/dependents of the tourism industry. In fact, the total investment is estimated at upwards of US\$60,000,000. If approved, construction at the facility is scheduled to last approximately 18 months, and is likely to provide employment for an average of forty (40) individuals during pre-construction, eight hundred (800) tradesmen and labourers during construction, which at its peak will increase to approximately twelve hundred (1200) workers and approximately eight hundred (1000) employees during the operational phase. Additionally, the multiplier effects to the construction and support industries during this period are likely to affect a much larger number of persons.

### ***LOCATION AND LAYOUT***

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The study area is split by the North Coast Highway and extends approximately 2.5km (~1.5mi) from Elgin Town (at the Molasses Factory), which is east of Lucea (Figure 1-1). The proposed development will consist of two stages of 1000 rooms, each with such facilities as restaurants, shops, bar, pool, spas, recreational areas, support facilities, and a sewage treatment plant.

A sewage treatment system designed to treat wastewater to the tertiary level using an activated sludge process is proposed for the development. This sewage treatment system is designed to produce an effluent that will be suitable for irrigation purposes in keeping with NEPA's irrigation standards. The system will be designed to a volumetric capacity of 82, 800 m<sup>3</sup>/month, which is inclusive of the 15% contingency required by NEPA, more capacity than will be generated by the facility at maximum occupancy. Wastewater will be collected at various pump stations throughout the facility, pumped to a principal septic tank then to the main collection tank for settling. The liquid portion is then transferred to large oxidation tanks where air is injected. When the bacterial process is completed, the liquid is passed through decanters (secondary settling tanks) where the solids and liquids are further separated; the liquid is filtered and chlorinated prior to going to the irrigation vault, while the solids are re-entrained into the front of the process.

The project is expected to consume approximately 72,000 m<sup>3</sup>/month of water during maximum occupancy of the development.

The hotel is also estimated to use approximately 4, 875, 000 kW/month during operation, which will be supplied from the Jamaica Public Service Company (JPS Co.) service lines. This represents a 7000 KW demand.

## **ALTERNATIVES**

Four alternatives to the development have been identified. These are:

- The No Action alternative

This alternative would see the cessation of project plans and the site retained in its present state, and is not a favoured action by the developers or community.

The "No Action" Alternative is likely to have the greatest implications on the socio-economic environment. This action would result in the loss of a major direct and indirect employment generating activity and foreign exchange revenue. For example;

- The project entails an investment of upwards of US\$60, 000, 000
- There are at least 1000 potential jobs at stake during operation
- There is significant spin-off potential in direct socio-economic benefits

The potential use of the site by squatters and for dumping of solid waste would aid in the degradation of the site and the community. If this alternative were adopted, the developers would need to find an alternative site for the development in Jamaica or elsewhere.

- The Proposed Development

This alternative would see the construction of the hotel as proposed by the developers. It would provide positive benefits such as employment for approximately 800 persons during construction and approximately 1000 who live in the wider community during operation. Additionally, the multiplier effect of this type of development would result in noticeable economic benefits for the parish of Hanover and the region. The proposed project will also make a positive contribution to social infrastructure, overall residential development, upkeep and renewal of the residential community. At this time there is strong support for this development from the residents of the area (based on results of a socio-economic survey).

This is the preferred alternative and is supported by the community.

- The Proposed Development with Modifications

Residents do have some concerns about sewage treatment, building heights and density with this project and want to see the project developed within the rules and regulations with minimal impact on the environment and the aesthetics of the community.

There is a recognized need for communication between the developers and residents of the surrounding communities. Through community meetings, any issues that arise will be resolved.

- The Proposed Development in Another Location

Other locations were considered in conjunction with the proposed Point location for implementation of this project. However, the Point property offered the following advantages over other locations considered:

- Size of available land was desirable
- Beach and waterfront location was ideal with beautiful white sand beach in two protected natural coves, and high quality marine environment
- Size of property allowed for inclusion of a tertiary level sewage treatment system with capability to treat to a level satisfactory for use as irrigation water
- Available infrastructure:
  - Modern highway in proximity to a major international airport, Sangster International Airport in Montego Bay
  - Water supply (Great River/Lucea water supply)
  - Electricity
  - Communications

## **POLICY, LEGISLATIONS, REGULATIONS & STANDARDS**

National Environmental Planning Agency (NEPA), the governing environmental agency, requires an environmental impact assessment (EIA) to be conducted for review along with the requisite development plans. The Environmental Control Division (ECD) of the Ministry of Health imposes guidelines for air, water and soil standards to be maintained after construction.

Legislations relevant to the establishment of a hotel development in Hanover are:

- The Natural Resources Conservation Authority (NRCA) Act, 1991
- The Wildlife Protection Act (1945)
- The Beach Control Act (1956)
- The Public Health Act (1974))
- Jamaica National Heritage Trust Act (1985)
- Town & Country Planning Act (1987)

## **ENVIRONMENTAL & SOCIAL BASELINE**

The parish of Hanover receives an average of 127-178cm of rainfall per year and has two distinct rainy periods, between the months of May and June and from October to

November. Temperatures range from 21 °C to 32 °C during the hottest months and 18 °C to 28 °C during the colder months. Hurricanes are a serious seasonal threat from July to November. The site is not in a major earthquake zone, as only three earthquake events of intensity greater than six on the modified Mercalli scale have been reported in the area between 1897 and 1978.

The shoreline soil is a part of the Hanover Shale Formation, and consists of an extensive outcrop of interbedded shales and sandstones. Structures built on slopes greater than 1:4 may be at risk. The soft, rubbly nature of the shale increases the risk of erosion during earth moving activities.

The vegetation communities on the site are a remnant of the original vegetation, and only contain a portion of the species usually found in typically coastal communities. The beach pioneer species included *Laguncularia racemosa* (White mangrove), *Coccoloba uvifera* (Sea grape), *Ipomea* sp. and *B. maritima* (Salt wort). The majority of the vegetation of the site consisted of mature tree species, typically coastal, which are adapted to hot, salty conditions. The dominant plants were *Acacia tortuosa* (Wild Poponox) and Seaside Mahoe (*Thespesia populnea*). Approximately sixty-two (62) plant species were recorded, none of which are endemic, rare, threatened or endangered.

Twelve (12) bird species were observed on the site, three (3) of which, the Sad Flycatcher, Jamaican Crow and Jamaican Blackbird, are endemic. In addition, burrows belonging to the species *Cardisoma guanhumi* (Great land crabs) were observed on the site.

An assessment of the marine communities in the area was done at 5 locations. At all locations, the reef communities showed signs of vitality and appear to be improving from past stresses and degradation. A wide variety of fish species were present at the locations.

The findings of the water quality sampling, indicated that water in the coastal waters at the time of sampling were in excellent condition. These results are promising, as the condition of the reefs appears to reflect the water condition recorded in the area. The type of sewage treatment system proposed for this development will not impact negatively on coastal waters, since there is no direct discharge to the environment.

The project area, Point, is adjacent a thriving Town, Lucea, the capital of the Parish. The parish has a calculated population of 66 602<sup>1</sup>. The parish capital, Lucea (estimated population of 12,129 in 2001, in a 7km radius including Point<sup>2</sup>) is west of the project area, and the town of Negril, the second largest tourism centre (estimated population of over 4,000 in 1999), is further east of the project area.

Residents in the community are in favour of the development being constructed. They cite issues ranging from need for employment to economic development of the area as reasons for the support.

## **POTENTIAL IMPACTS & MITIGATION**

No major impacts on the environment were identified in the proposed development. The removal of vegetation and ecological habitats is unavoidable and is the main trade-off to be made against the economic benefits to be derived from project implementation. However, careful planning can ensure protection of some mature standing trees, and by extension, any endemic terrestrial fauna. Issues related to dust management will be addressed in the monitoring plan for construction and should not be a major issue.

An environmental impact matrix is a simple tool for identifying the possible impacts, whether positive or negative, of human activities on the environment. The activities carried out during the various phases of the hotel development are considered in the matrix with respect to the environmental factors that are deemed relevant to the specific site, or which may be affected indirectly as a result of project activities. The impact mitigation matrix highlights those activities needed to remove or ameliorate the identified significant adverse impacts and to enhance the positive aspects of the development.

The construction of buildings, ancillary facilities, parking areas etc., will permanently cover the soil surface, rendering these areas impermeable to infiltration of water in the soil, and increasing surface runoff. This runoff will be properly managed and channelled into soak-away pits (French drains) to lessen the impact of storm water on the marine environment.

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<sup>1</sup> World Gazetteer: *Jamaica: Administrative Divisions (population and area)*  
[http://www.world-gazetteer.com/r/r\\_jm.htm](http://www.world-gazetteer.com/r/r_jm.htm), Accessed December 2005

<sup>2</sup> Falling Rain Genomics, Inc. 1996-2004 <http://www.fallingrain.com/world/JM/2/Lucea.html>, Accessed December 2005

**TABLE 0-1: POTENTIAL IMPACTS & PROPOSED MITIGATION STEPS**

Potential Impact	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<b>Removal of Vegetation, Loss of Habitat</b>	Pre-Construction [Site Clearance]	Land, Flora, Fauna, Endemic Species	Medium & Immediate/Long-term	Direct/Minor Negative / Reversible impact	Included in cost of construction
<p><b>Mitigation Measures:</b>                      The removal of vegetation and ecological habitats is unavoidable and is the main trade-off to be made against the economic benefits to be derived from project implementation. By design many mature trees will be left intact, and by extension, any endemic terrestrial fauna. Species re-introduction should occur naturally in these areas.</p>					
Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<b>Aesthetics</b>	Construction [Zinc Fencing around Project Area]	Humans (Nearby Residential Communities)	Minor & Approx. 18 months	Minor Negative/Indirect/ Sporadic/Unavoidable Impact	Minimal cost if existing fence is maintained
<p><b>Mitigation Measures:</b>                      Maintenance and Upkeep. Construction Monitoring. Communication with Residents/Resorts. Speedy Removal.</p>					

Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<b>Noise, Fugitive Dust, Air Pollution</b>	Pre-Construction & Construction [Vehicular Traffic (Trucks/Heavy Equipment), Soil Stockpiles, Construction Activities]	Humans (Residential and Resort Communities)	Medium & Occasional (Approx. 18 months)	Minor Negative/indirect/Sporadic/Avoidable Impact	External monitoring
<p><b>Mitigation Measures:</b></p> <p>Appropriate scheduling of activities. Construction Monitoring. Dust Suppression through sprinkling. Proper Servicing of Equipment. Quick Response. Communication With Residents/Resorts. Covered vehicles on public roads Flag men will be utilized to manage traffic flow in and out of the site</p>					
Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<b>Storm water, Erosion, Sedimentation, Silting, Run-Off to Sea</b>	Pre-Construction & Construction [Site Clearance, Vegetation Removal, Excavation]	Marine/Coastal Zone	Medium & Occasional/Long Term (through occupational phase)	Minor Negative/Indirect/Sporadic/Avoidable Impact	Should not exceed JA\$1.0 Million
<p><b>Mitigation Measures:</b></p> <p>Careful Phasing of Activities With Consideration of Rainy Seasons. Construction Monitoring. Implementation of Control Devices (Drainage, Silt Fencing, Soak-away, etc.)</p>					



Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<b>Flooding Potential, Drainage Patterns, Storm Surge, High Water Table.</b>	Construction & Operation [Incidental Rainfall, Hurricane, Excavation, Soak Away]	Groundwater, Coastal Waters, Project Area	Medium & Occasion/Long-term	Minor Negative/Indirect/Occasional/Avoidable Impact	Included in construction cost
<p><b>Mitigation Measures:</b></p> <p>Site designed to withstand 10-year return rainfall event. Construction Monitoring. Maintain design elevations. Maintain site drainage mechanisms. Not a typical problem in the area.</p>					
Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<b>Sewage and Wastewater (Effluent/Odour)</b>	Construction & Operation [Sewage Treatment System, Temporary Sewage Handling during Construction]	Coastal Waters, Groundwater, Human	Minor & Long-term	Minor Negative, indirect, avoidable impact	Septic Hauler during construction period (included contract)
<p><b>Mitigation Measures:</b></p> <p>Operate and Maintain facility in keeping with designs. Quick Response to issues. Implement contingency plans as needed (Septic Hauler, etc.). System has no direct discharge to the environment. Treated effluent goes to irrigation. Utilize licensed temporary sewage system provider for Portable Toilets and associated disposal.</p>					

Activity	Action	Environment al Receptor	Magnitude & Duration	Significance	Economic Value
<b>Socio-Economic/Cultural/Loss of Traditional Use and Access to Beach</b>	Pre-Construction, Construction & Operation [Entire Development]	Human	Large & Long-term	Minor Negative/direct impact	Not Quantifiable
<p><b>Mitigation Measures:</b></p> <p>Positive socio-economic impacts. Provide public access if possible or prudent to beaches. Identify optional public resources in proximity for bathing, fishing, etc. Recognize Prescriptive Rights of population to utilize beach. Secure any identified cultural heritage resources through JNHT.</p>					
Activity	Action	Environment al Receptor	Magnitude & Duration	Significance	Economic Value
<b>Solid Waste Handling and Disposal</b>	Pre-Construction, Construction & Operation [Vegetation Removal/Construction Activities/Packaging]	Coastal Waters, Land, Groundwater, Humans, Aesthetic	Minor & Occasional/Long-term	Minor negative, direct, avoidable impact	Included in cost of construction
<p><b>Mitigation Measures:</b></p> <p>Minimize and reduce quantities of solid waste generated during site preparation and construction. A waste management plan should be prepared and followed. If practical, branches and leaves can be put through a wood chipper to make soil cover for garden beds, etc. Solid Waste not utilized on site should be disposed of in an approved landfill by approved haulers. An approved waste removal service should be contracted to remove waste produced on site.</p>					

Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<b>Noise, leaks, exhaust from construction implements (batching plants, heavy equipment), petrol/oil/lubricant storage</b>	Pre & Post Construction, Operation	Soils, Groundwater, Coastal Waters, Air, Humans	Medium & Long-term	Minor negative, direct, sporadic, avoidable impact	Equipment Maintenance included in contractors scope
<p><b>Mitigation Measures:</b></p> <p>Equipment and chemical storage will be monitored and maintained on a regular basis. Any indication of leaks, discharge to the ground will be addressed immediately. Equipment maintenance on site will be minimal and monitored. Construction monitoring will include these potential impacts.</p> <p>Chemicals and fuels with a potential to leak, will be stored in secured, impermeable areas to reduce the likelihood of contamination (e.g. the diesel fuel tank proposed for the facility, will be housed in a reinforced concrete vault and properly sealed).</p>					

**TABLE 0-2: POTENTIAL IMPACTS & PROPOSED MITIGATION STEPS CONT.**

Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<b>Beach Aesthetics</b>	Construction [Vegetation Removal/Construction Activities/Coastline Modification]	Soils, Groundwater, Coastal Waters and Marine Flora & Fauna therein,	Medium & Short-term	Minor negative, direct, sporadic, avoidable impact	Included in cost of construction
<p><b>Mitigation Measures:</b></p> <p>Requires excavation of sea grass and coarse material (gravel etc.) and the introduction of higher quality sand (finely graded, possibly from offshore). Silt screens will be used to contain sedimentation during beach filling exercises. Sea grasses removed may be transplanted at a suitable location along the coast.</p> <p>Equipment and chemical storage will be monitored and maintained on a regular basis. Any indication of leaks, discharge to coastal waters will be addressed immediately. Equipment maintenance on site will be minimal and monitored. Construction monitoring will include these potential impacts.</p>					
Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<b>The increase in traffic (buses, cars, staff vehicles etc.) noise levels, gaseous emissions</b>	Construction & Operation of Facility	Human	Minor & Occasional over Long-Term	Minor negative, direct, occasional, avoidable impact	No major cost associated

**Mitigation Measures:**  
 The increase in traffic, while a notable impact, is not anticipated to be significant due to planned improvements to the local roadways (Highway 2000) and the overall development of the area as a tourist resort area. If the facility owns vehicles, they will insure that they are properly maintained at all times. Offending contract vehicles will be prohibited from the property.

Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
Utilities Shortfall (Potable Water Supply and Electricity Shortfall)	Operation of Facility	Human (Community and General Area)	Medium & Unsure	Minor negative, direct, avoidable impact	NWC & JPS Co. responsibility

**Mitigation Measures:**  
 Work with NWC and JPS Co. to develop independent/reliable source of each utility for the resort. Initiate water and energy conservation and minimization. Utilize treated wastewater for irrigation.

Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
Solid Waste Management	Operation of Facility	Land, Soils, Air, Human, Coastal Waters	Minor & Occasional	Minor indirect, occasional, avoidable impact	Included in waste haulers contract

**Mitigation Measures:**  
 It is in the best interest of the facility to maintain high quality waste management and disposal practices. Garbage skips/dumpsters will be strategically placed throughout the site and emptied as needed by a contract solid waste company for disposal at an approved landfill.

## ***MONITORING PLAN***

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The monitoring plan devised for the development should be implemented at the pre-construction, construction and operational phases of the project. Monitoring should involve the assessment of activities to ensure adherence to the recommendations made to reduce negative impacts. This should include monitoring for noise, dust, erosion and storm water management.

## ***CONCLUSION***

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This development is supported by the community. The developers are willing to work with the regulatory agencies and community to insure that the development is pleasing and acceptable to all involved. Additionally, this development will have no major negative environmental impact and will result in several major positive socio-economic impacts on the surrounding communities and country as a whole. It is our recommendation that this project be approved for development and a permit granted.

# **PROJECT DESCRIPTION**

---

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# 1 PROJECT DESCRIPTION

---

---

## 1.1 INTRODUCTION

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Fiesta Jamaica Limited is proposing to develop its first resort in Jamaica at a site located at Point Estates, Hanover. The proposed site is situated on 80.94 hectares (200 acres) of land located on the north-eastern side of the Lucea Harbour on the north coast of Jamaica east of the town of Lucea, and directly across the bay from the historical site, Fort Charlotte.

The construction phase of the proposed hotel development is scheduled to last approximately 18 months and will consist of 2000 rooms to be developed in two stages, with a total occupancy floor area of approximately 334, 781.40 m<sup>2</sup>. The entire project is divided into four (4) different stages. The first and second stages will count for 1000 rooms each. Stage 1 and 2 entails the construction of two hotel complexes each. For the purpose of this report, the buildings have been labelled “Hotel I” and “Hotel II” in stage 1, and “Hotel III” and “Hotel IV” in stage 2.

### 1.1.1 STAGE 1

---

Hotels I and II are divided into Junior Suites, Villas and Luxurious Royal Service Bungalows. This stage will also have shared service areas and kitchens which will be adaptable to provide service to Stage 2 (Hotel III and IV) simultaneously if required.

Hotel I will comprise 9 junior suite bungalows each having 36 rooms for a total of 324 rooms; and 4 junior suite bungalows (Type B) each having 48 rooms for a total of 192 rooms.

Hotel II will comprise 3 royal service bungalows each having 36 rooms for a total of 108 rooms; 7 junior suite bungalows each having 36 rooms, total 252 rooms; 1 junior suite bungalow (Type B) of 48 rooms, total 48 rooms; and 19 villas each having 4 rooms, total 76 rooms.

All rooms will have an approximate floor area of 57 m<sup>2</sup> with the exception of the villas which will have an approximate floor area of 80 m<sup>2</sup>.



A multifunctional Central Building may include commercial areas, administrative offices, a main lobby area, theme restaurants, a casino, a convention centre, and show rooms. Adjoining this area will comprise pools (including restaurant-styled pools). An underground parking area will be housed beneath the Central Building capable of receiving 300 cars.

The Sports Centre will include facilities for 4 tennis courts, 2 paddle courts, 1 archery range, 1 basketball court and 1 volleyball court, and an indoor soccer field. A spa unit will also be constructed comprising; spa pools, solarium, gym, massage parlours, dressing rooms and beauty parlours.

### **1.1.2 STAGE 2**

---

Hotels III and IV will comprise a combination of villas and Type B junior suites, with the same approximate floor area as Stage 1. A central building area will also be built to give service to Hotels III and IV and will comprise a Disco, Restaurants and Bars, a mini club, and underground parking for 300 cars. This stage will also utilise the sports and spa unit to be built in stage 1.

Hotel III will comprise 6 Bungalow Junior suites Type B, each having 48 rooms for a total of 528 rooms; and 5 villas each having 4 rooms for a total of 20 rooms.

Hotel IV will comprise 6 Bungalow Junior suites Type B each, having 74 rooms for a total of 444 rooms; and 4 villas each having 4 rooms for a total of 16 rooms.

All rooms will have an approximate floor area of 57 m<sup>2</sup> with the exception of the villas which will have an approximate floor area of 80 m<sup>2</sup>.

The central building area will comprise pools (including restaurant-styled pools), theme restaurants, commercial areas, administrative offices, a main lobby area, casino hall and convention rooms.

**TABLE 1-1: SQUARE METRES OF OCCUPANCY PER TYPE OF ROOM**

Type of Rom	Total Floor Area (m <sup>2</sup> )
Junior Suite Bungalow	1031.50
Junior Suite Bungalow Type B (16 rooms per floor)	1278.20
Royal Service Bungalow	1166.60
Villas	214.20



## **1.2 STRUCTURAL SCOPE OF BUILDINGS**

### **1.2.1 CENTRAL BUILDING**

---

The configuration of the central building is an irregular shape divided by sectors developed in 1 and 2 storey, the function of this sectors are public an operation areas such as offices, meeting rooms, etc.

The building sectors have been provided by separation joints between each sector and the adjacent one.

#### **1.2.1.1 STRUCTURAL FEATURES:**

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The structural system selected are in situ reinforced concrete rigid frames and in conjunction with floor diagrams in reinforced concrete with the beam like boundary element, all the concrete elements are designed in accordance with the 4.4 national building code of Jamaica, the latest version of ACI 318.

The proposed foundation is a shallow type, with reinforced concrete strip and isolated footing designed that the soil pressure shall be reasonably uniform to minimize differential settlement. However, where the bearing capacity of soil is in question, before any foundation activity is advised that the design capacity of the soil be substantiated by an examination of subsoil conditions, the foundation system could switch to a deep solution like cast in place concrete piers or reinforced concrete bearing piles. All the foundation elements and the capacity of soil would be designed in accordance with the 4.2, 4.2.2 national building code of Jamaica and the latest version of ACI 318.

The rigid frames and floor diagrams are designed like resisting system for earthquakes in accordance whit recommended lateral force requirements and commentary seismology committee structural engineers association of California.

The effect of wind pressure on these buildings is determined in accordance with the latest edition of BSCP chapter v, part 2. The basic speeds taken are not less than 56 ms<sup>-1</sup> at a height of 10 meters above the ground.

### **1.2.1.2 BUNGALOWS AND VILLAS**

The hotel project will comprise three (3) royal service bungalows, 16 Bungalow Junior Suites and 5 Bungalow Junior Suites Type B, as 3-storey buildings, with irregular but symmetrical shapes, the function of these buildings being guest rooms.

#### **1.2.1.2.1 STRUCTURAL FEATURES**

The structural system selected are masonry shear walls in both directions confined with reinforced concrete posted/tie columns and reinforced concrete slabs, the floor system are diagrams in reinforced concrete with beams and slabs like boundary element.

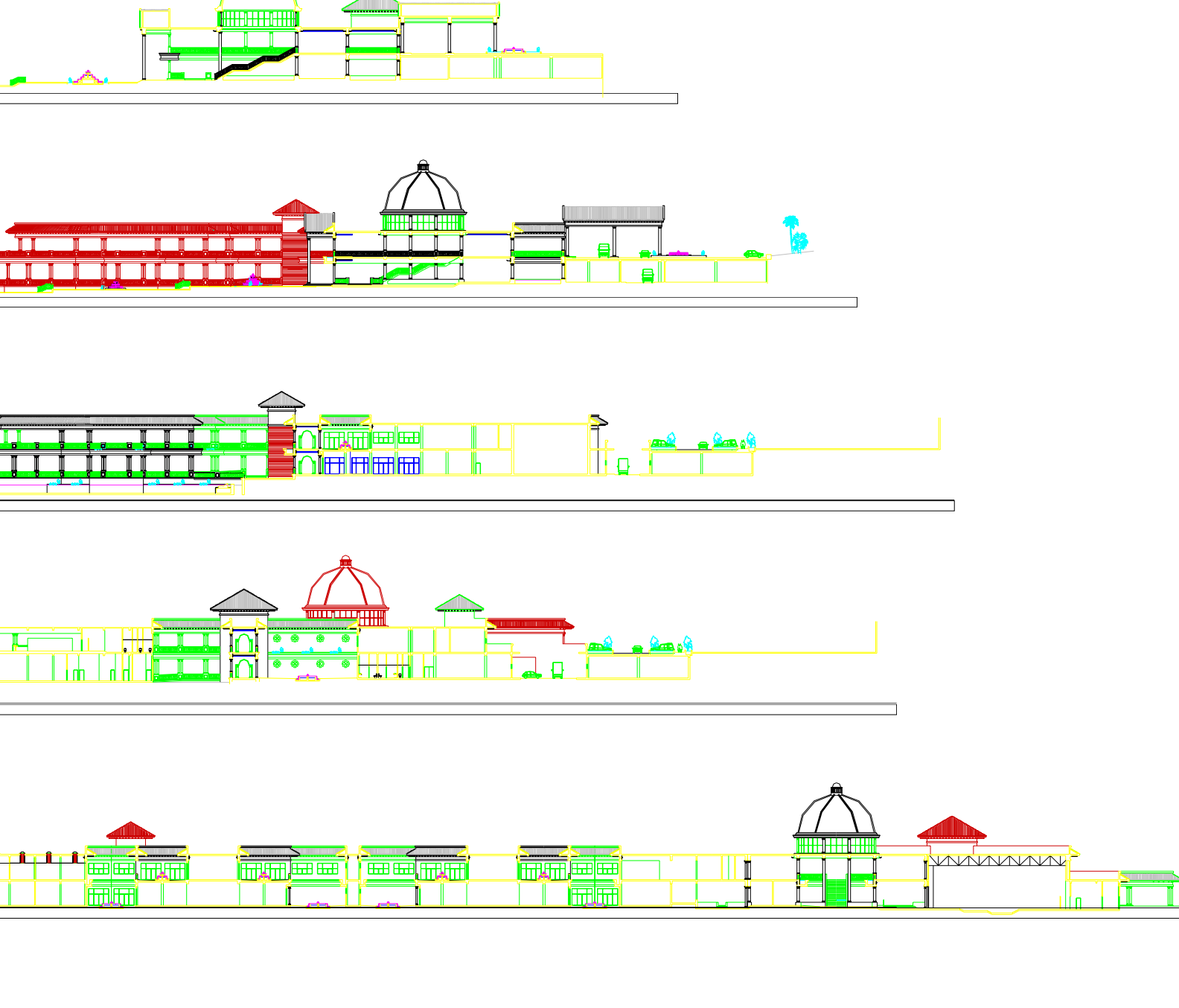
The proposed foundation is of shallow type, with reinforced concrete strip and isolated footing designed that the soil pressure shall be reasonably uniform to minimize differential settlement. However, where the bearing capacity of the soil is in question, before any foundation activity it is advised that the design capacity of the soil be substantiated by an examination of subsoil conditions, the foundation system could switch to a deep solution like cast in place concrete piers or reinforced concrete friction piles. All the foundation elements and the capacity of soil would be designed in accordance with the 4.2, 4.2.2 national building code of Jamaica and the latest version of ACI 318.

The confined shear walls and floor diagrams are designed like resisting system for earthquakes in accordance with recommended lateral force requirements and commentary seismology committee structural engineers association of California.

The effects of wind pressures on these buildings are determined in accordance with the latest edition of BSCP chapter v, part 2. The basic speeds taken are not less than 56 ms<sup>-1</sup> at a height of 10 meters above the ground.

Detailed design criteria, parameters, codes and rules are provided in Appendix IV.





NORTH

LOCATION IN PLAN

PLAN / SCHEMATIC SECTION

NOTES :

ALVARO SANS  
GABRIEL TELLEZ

PROJECT :  
HOTEL PALLADIUM  
JAMAICA

LOCATION :

PROPRIETARY :

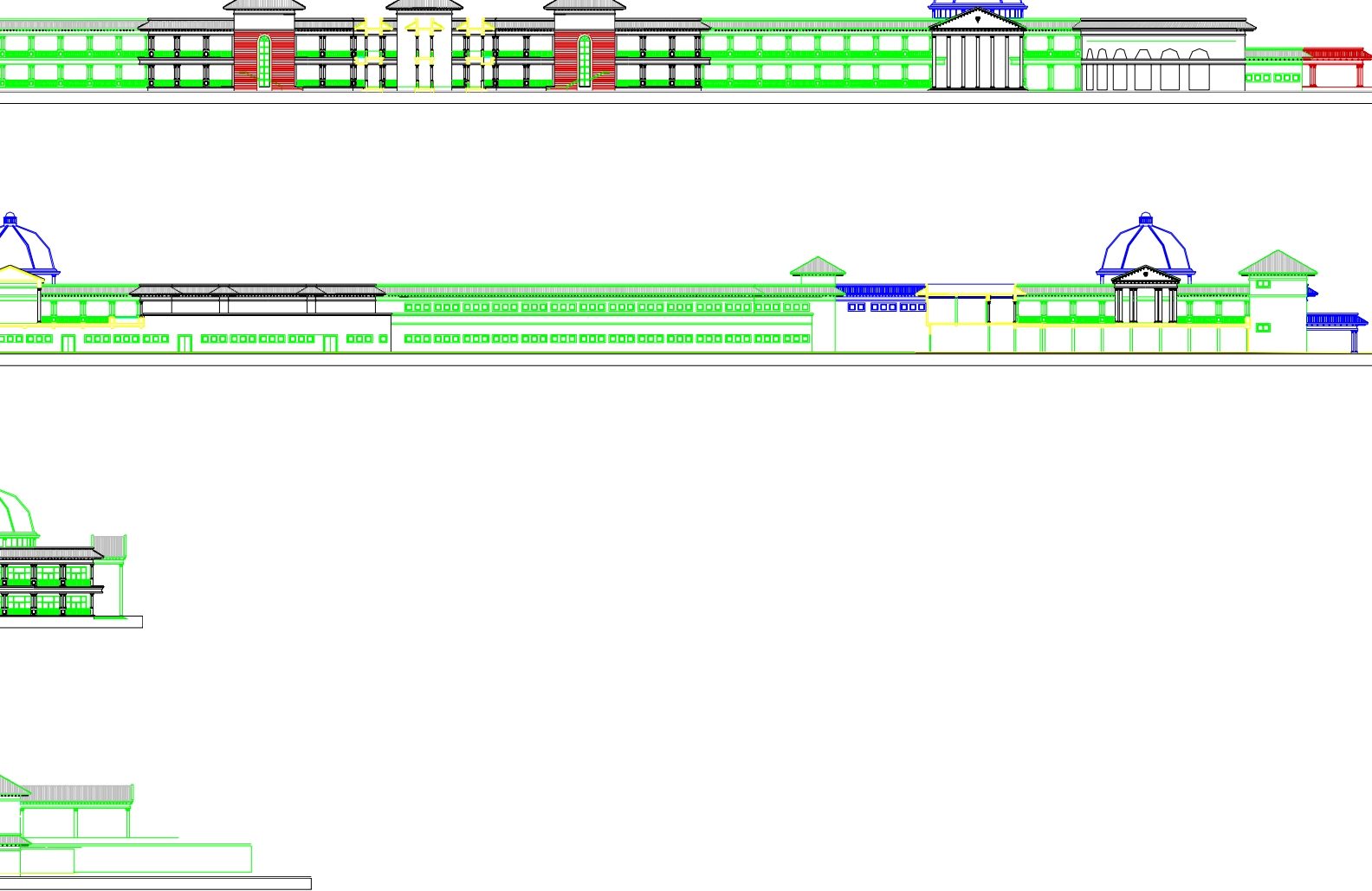
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-ARCHITECTURAL-  
SECTIONS A, B, C,  
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 REVISOR: AS/GT  
 CHECKED BY:  
 MADE IN: DATE SEPT 7th 2005

PROJECT N°:  
 DRAWING NAME: HJAR CB03

**FIGURE 1-3: CENTRAL BUILDING ELEVATIONS OF PROPOSED FIESTA HOTEL, POINT, HANOVER**



LOCATION IN PLAN

PLAN / SCHEMATIC SECTION  
NOTES :

ALVARO SANS  
GABRIEL TELLEZ

PROJECT :  
HOTEL PALLADIUM  
JAMAICA

LOCATION :

PROPRIETARY :

DRAWING TITLE :

CENTRAL BUILDING  
-ARCHITECTURAL-  
ELEVATION TYPES A,  
B, C, & D.

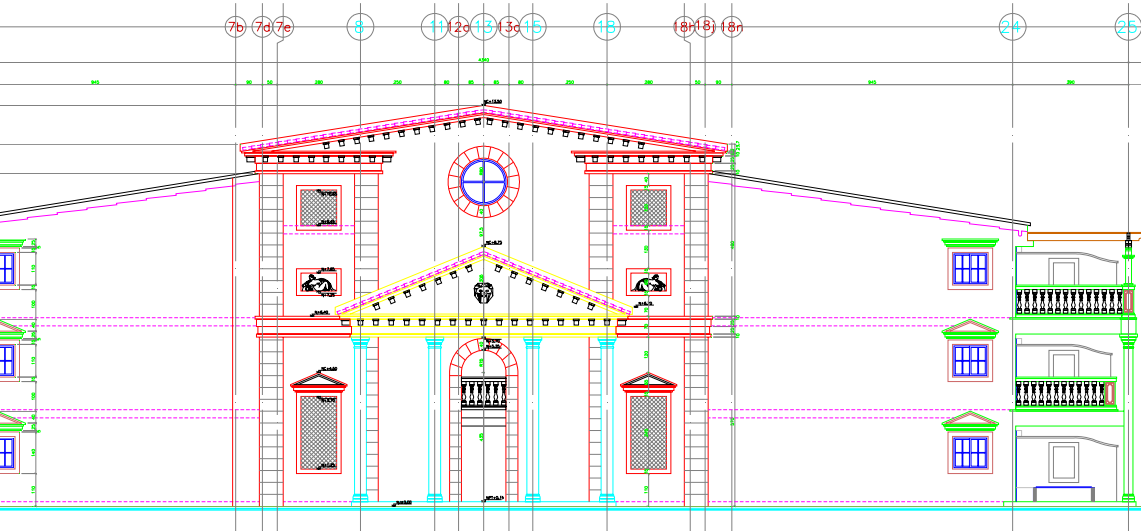
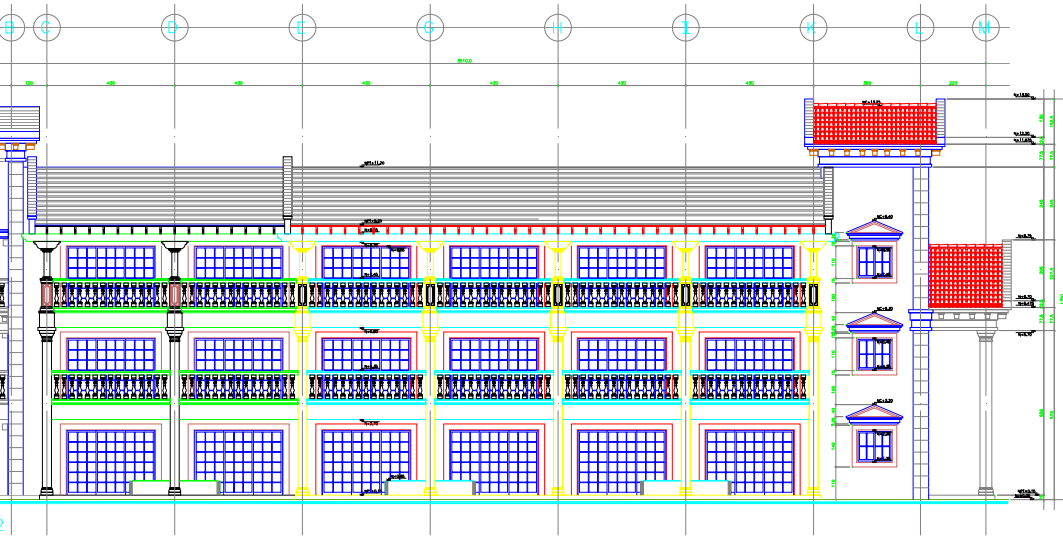
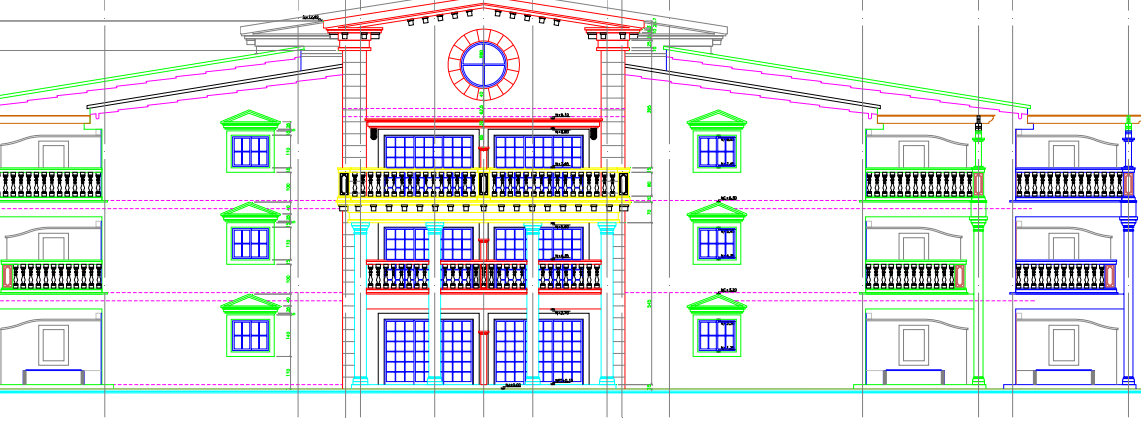
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DESIGNED BY: AS/GT  
 REVISOR: AS/GT  
 CHECKED BY:  
 MADE IN:  
 DATE: SEPT 7th 2005

PROJECT NO:  
 DRAWING NAME:  
 HJAR CB04

**FIGURE 1-4: CENTRAL BUILDING ELEVATIONS OF PROPOSED FIESTA HOTEL, POINT, HANOVER**





NORTH

LOCATION IN PLAN

PLAN / SCHEMATIC SECTION

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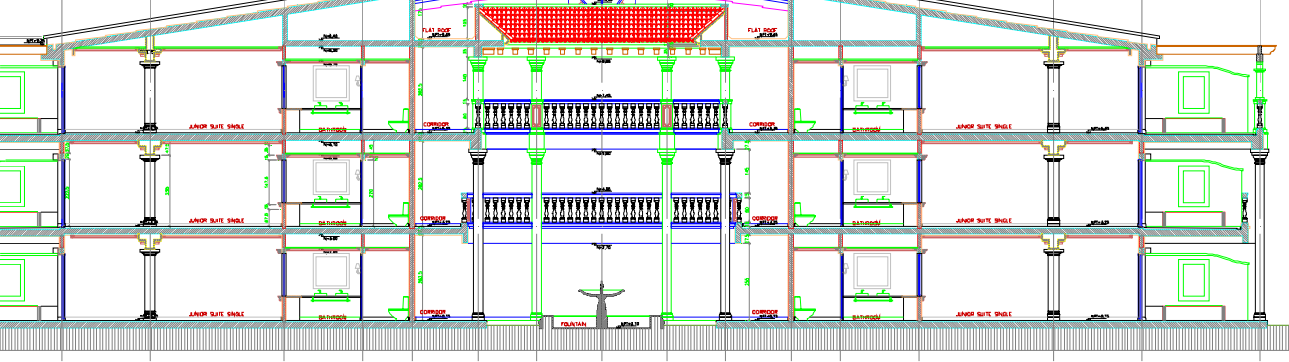
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PROJECT  
HOTEL PALLADIUM  
JAMAICA

LOCATION :

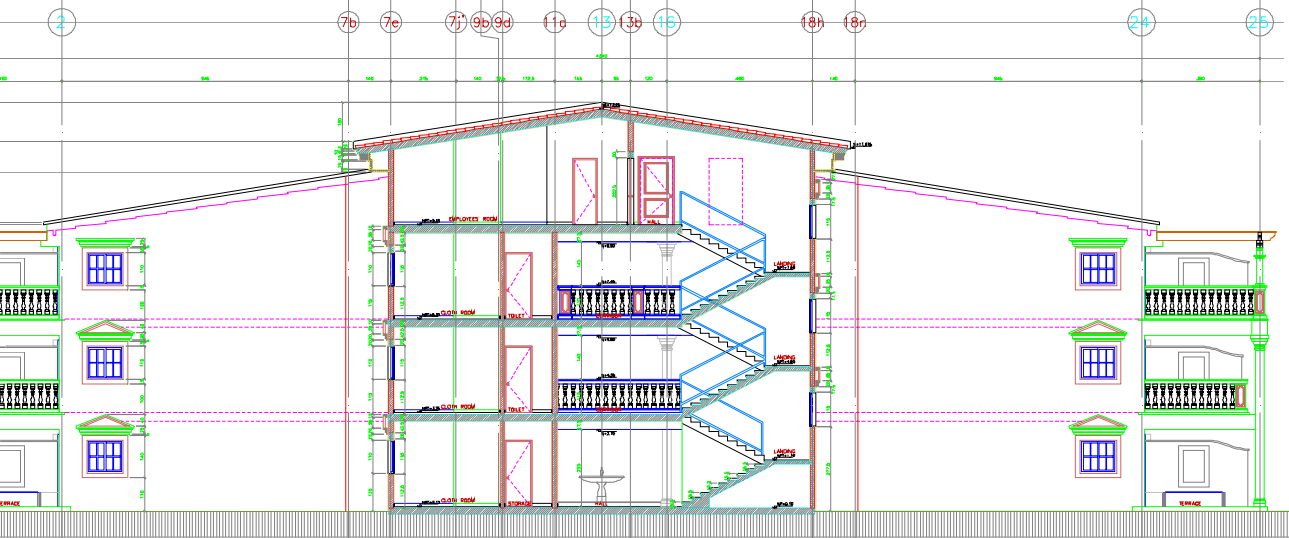
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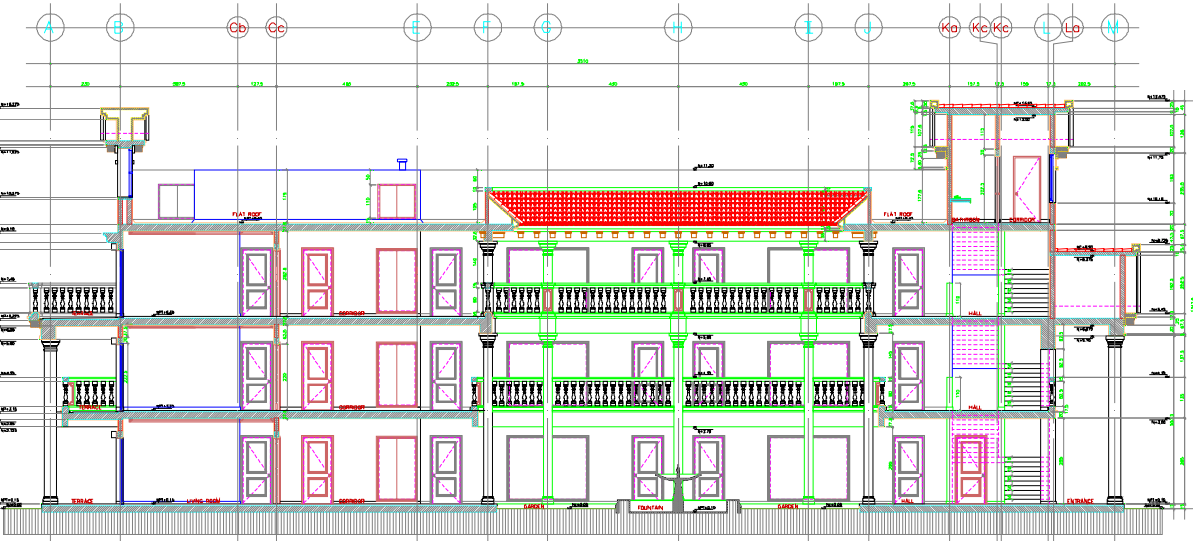
BUNGALOW ROYAL SERVICE  
ELEVATIONS



TRANSVERSE SECTION CT-1



TRANSVERSE SECTION CT-2



LONGITUDINAL SECTION CL-1

LOCATION IN PLAN

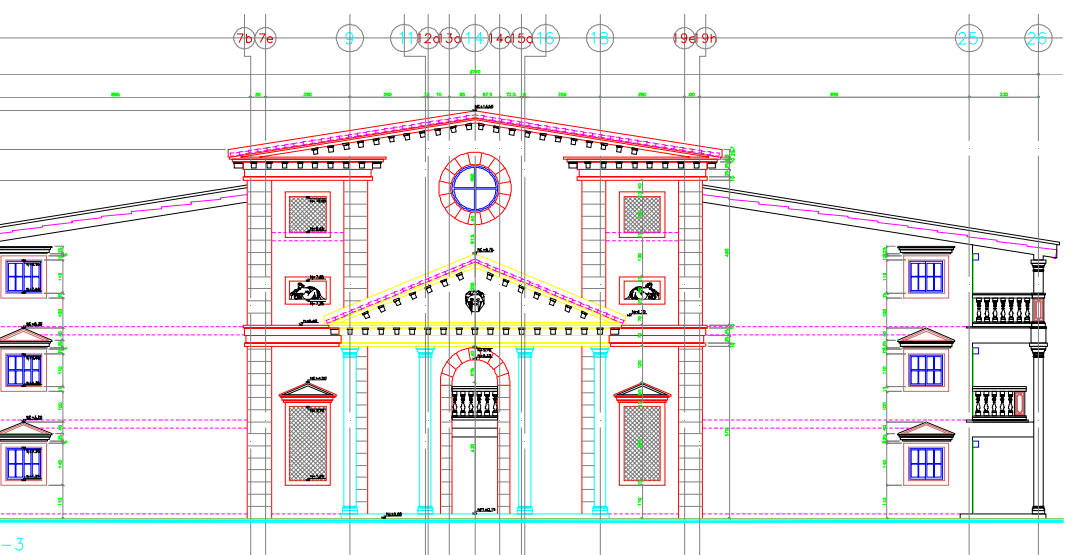
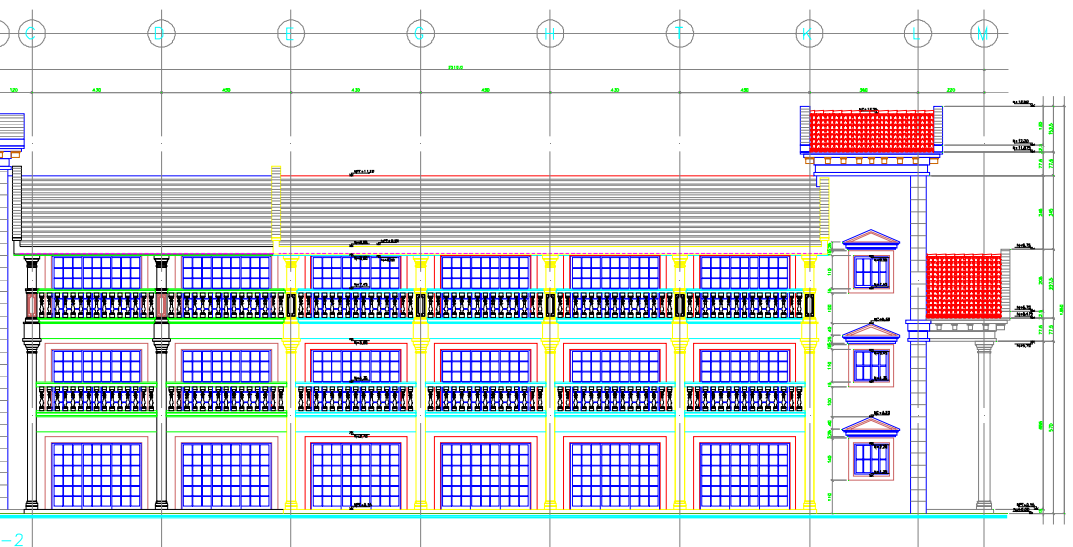
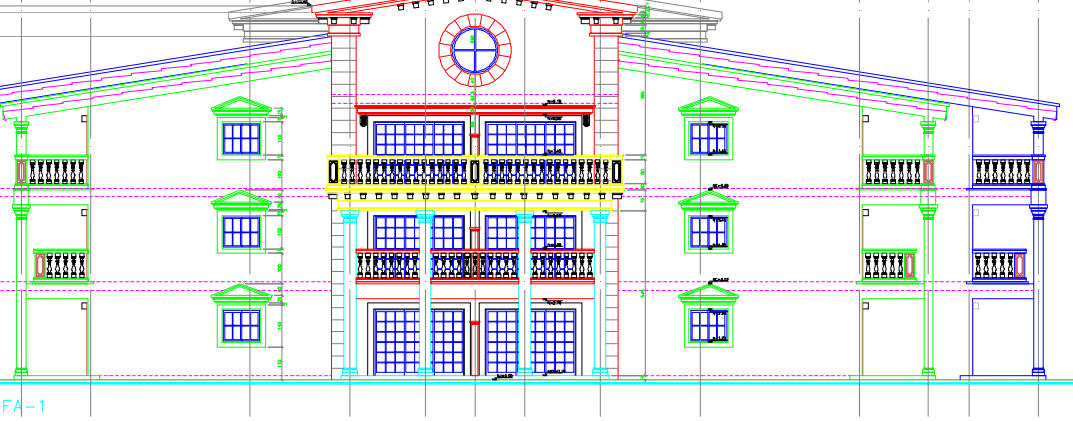
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GABRIEL TELLEZ  
PROJECT  
HOTEL PALLADIUM  
JAMAICA

LOCATION :

PROPRIETARY :

DRAWING OF :  
BUNGALOW ROYAL SERVICE  
SECTIONS



NORTH

LOCATION IN PLAN

PLAN / SCHEMATIC SECTION

NOTES

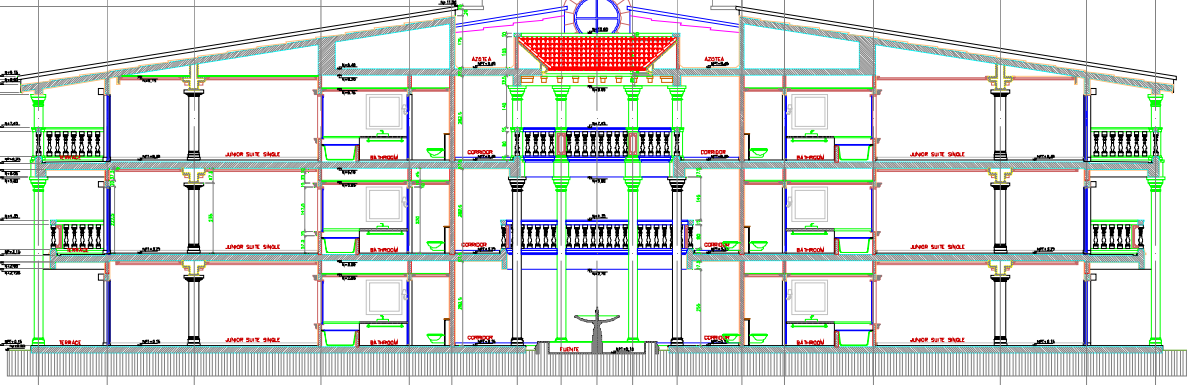
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GABRIEL TELLEZ

PROJECT NAME:  
RESORT PALLADIUM  
JAMAICA

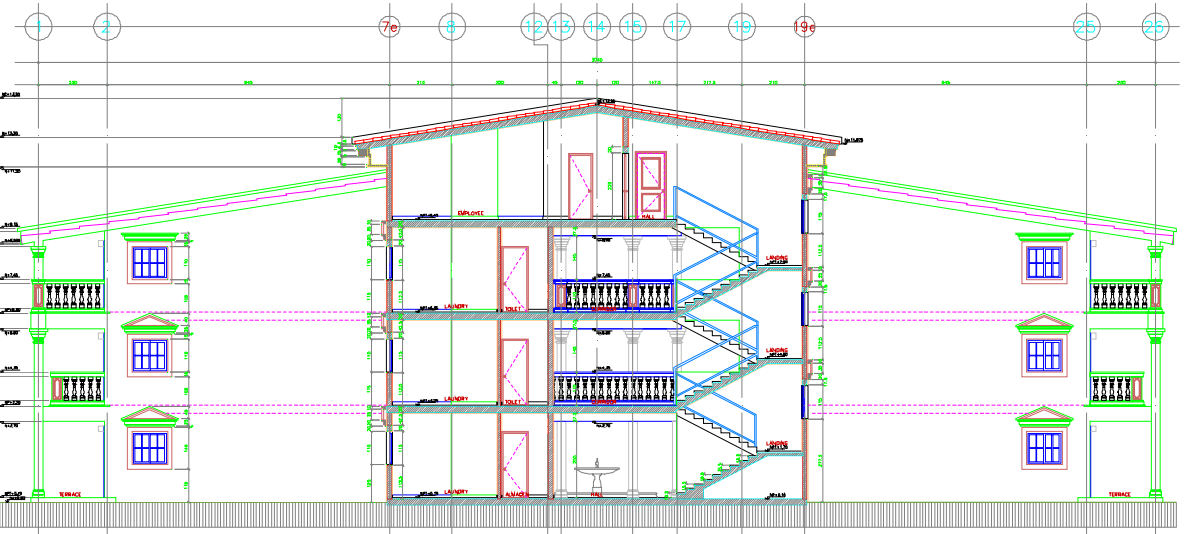
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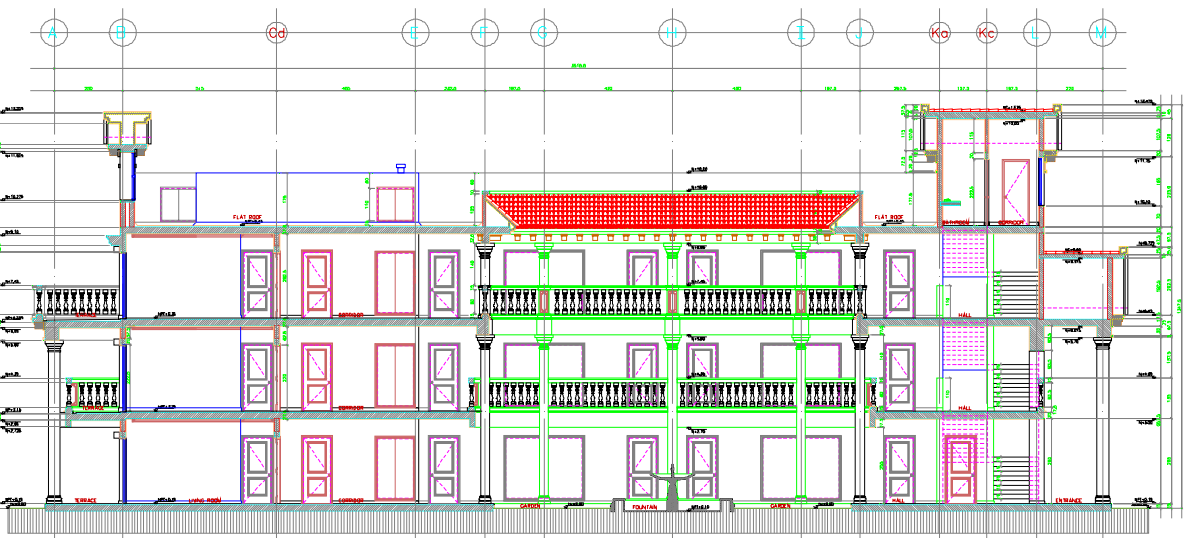
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ELEVATIONS



SECTION CT-1



SECTION CT-2



SECTION CL-1

NORTH

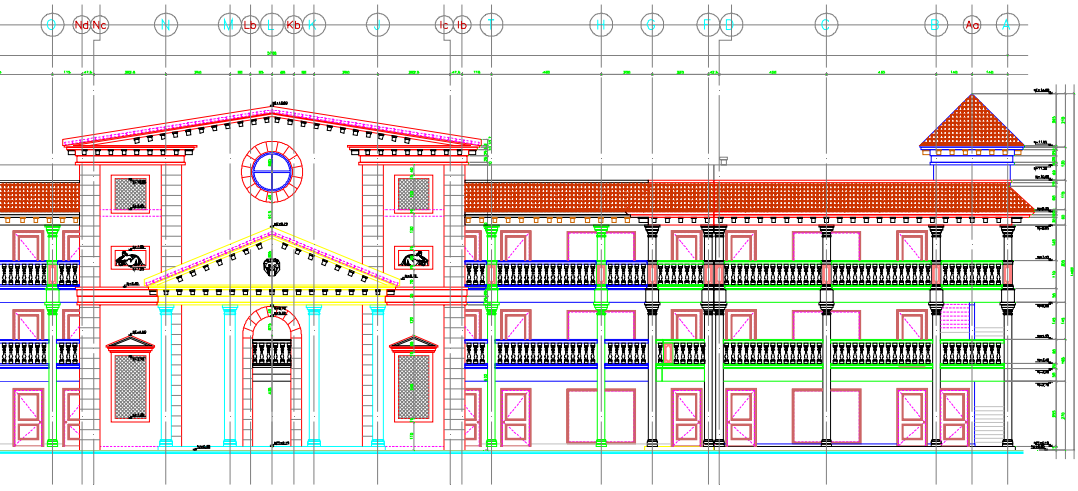
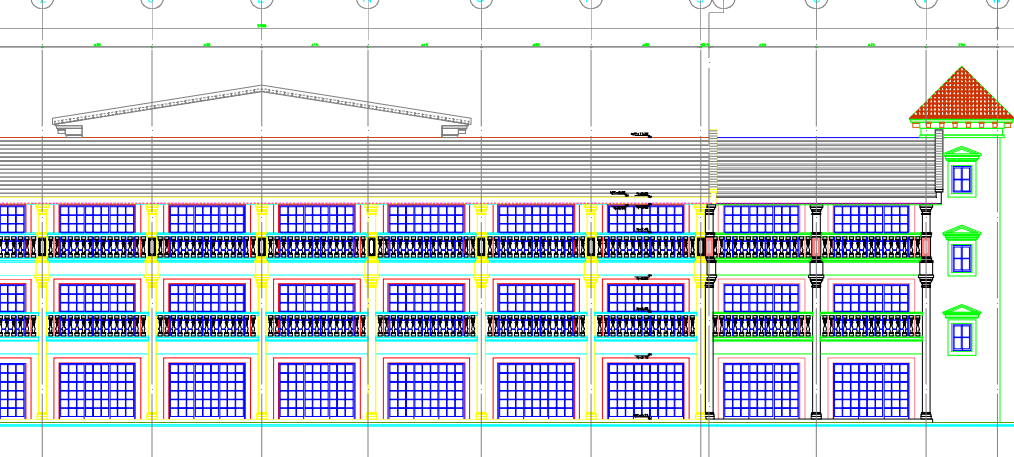
LOCATION IN PLAN

PLAN / SCHEMATIC SECTION

NOTES

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 GABRIEL TELLEZ  
 PROJECT NAME:  
 RESORT PALLADIUM  
 JAMAICA  
 LOCATION:  
 PROPRIETARY:  
 DRAWING TITLE:  
 BUNGALOW JUNIOR SUITES  
 SECTIONS





LOCATION IN PLAN

PLAN / ESQUEMATIC SECTION

NOTES 1

ALVARO SANS  
GABRIEL TELLEZ

PROJECT NAME  
RESORT PALLADIUM  
JAMAICA

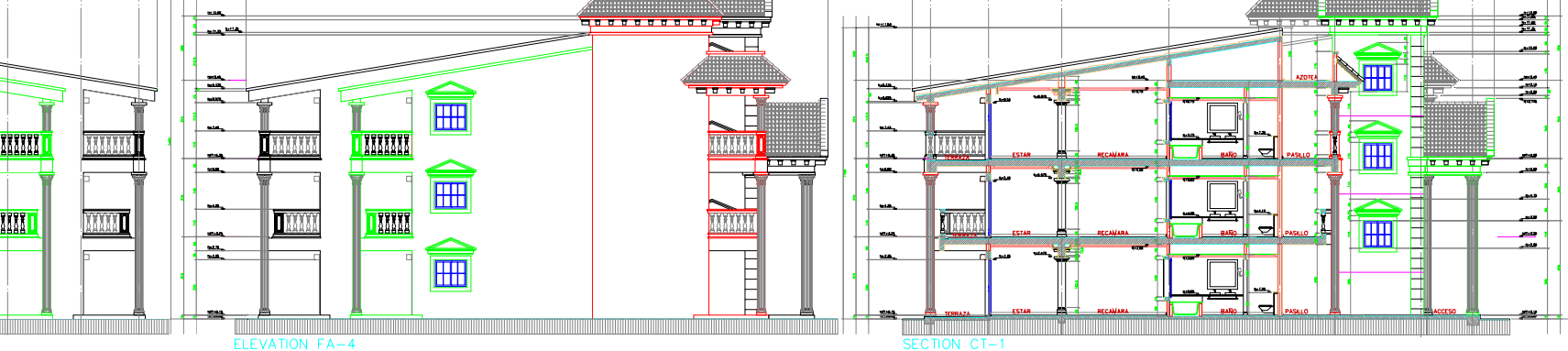
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TYPE "B", ELEVATIONS

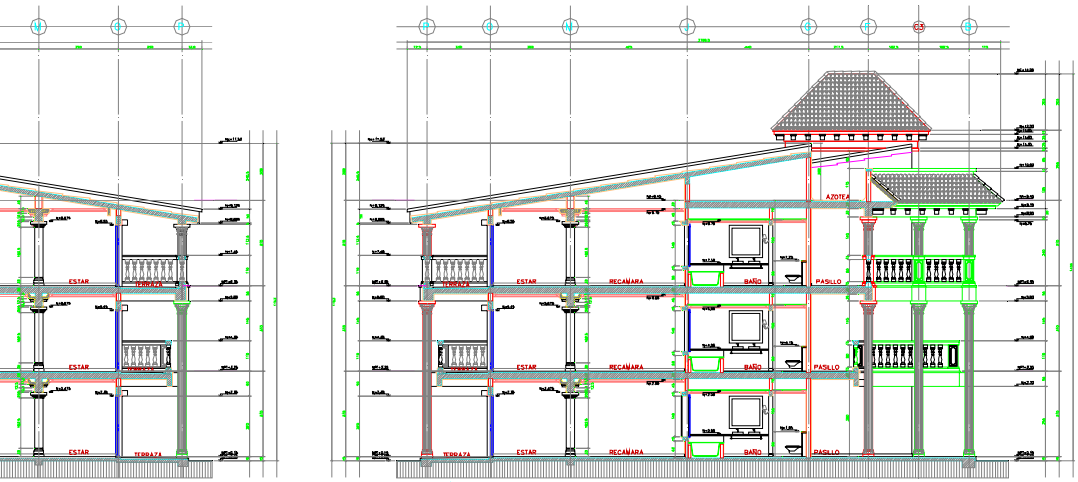
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**FIGURE 1-10: BUNGALOW JUNIOR SUITE TYPE B ELEVATIONS**



ELEVATION FA-4

SECTION CT-1



SECTION CT-3

LOCATION IN PLAN  
PLAN / SCHEMATIC SECTION  
NOTES :

ALVARO SANS  
GABRIEL TELLEZ  
PROJECT NAME :  
HOTEL PALLADIUM  
JAMAICA  
LOCATIONS :  
\*  
\*  
\*  
PROPRIETARY :  
\*  
\*  
DRAWING TITLE:  
BUNGALOW JUNIOR  
SUITE TYPE - B  
ELEVATIONS FA-2, FA-4  
SECTIONS CT-1, CT-2,  
CT-3


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FIGURE 1-11: BUNGALOW JUNIOR SUITE TYPE B ELEVATIONS & SECTIONS







 <p>NORTH</p>
<p>LOCATION IN PLAN</p>
<p>PLAN / SCHEMATIC SECTION</p> <p>NOTES :</p>
<p>PROJECT :</p> <p>HOTEL PALLADIUM JAMAICA</p>
<p>LOCATION :</p> <p>•</p>
<p>PROPRIETARY :</p> <p>•</p>
<p>DRAWING TITLE :</p> <p>MASTER PLAN -ARCHITECTURAL- MAIN FLOOR PLAN</p>

During construction, the property will be fenced along the boundary lines to provide for security and minimize the potential for fugitive emissions of dust to impact on the neighbouring establishments or traffic. Temporary buildings will be utilized onsite during construction for storage and field offices. These buildings will be removable containers and/or temporary structures on the site.

Mobile temporary chemical toilets will be provided throughout the construction phase through contract with an approved company. These units will be fully contained and will be removed from the site where they will be disposed of appropriately. At the request of any regulatory agency, the contracted company will be subject to an audit of its operations to insure that waste materials are properly handled and disposed of.

Approximately one quarter of the available lands is expected to be preserved in its existing state (more or less) with brush removal and landscaping being done to maintain the aesthetics of the development and the area. Mature trees will be left in place, as much as practicable. There is adequate parking for the hotel on the coastal strip north of the Highway. All structures to be built on the site will adhere to and fall within the regulations and standards of the Hanover Parish Council and the Natural Resources Conservation Act of 1991, which is enforced by the statutory body, the National Environmental Planning Authority (NEPA).

### **1.3 SEWAGE/WASTEWATER TREATMENT**

In order to preserve the ecological integrity of the site, the project will incorporate a Water Treatment Plant that will adequately service both stages of the proposed development.

Two types of wastewater will be generated at the hotel development:

1. Black Water (faecal content and general human egested/excreted waste)
2. Grey Water (bath, laundry and wash basin water)

\*The grey water to black water ratio will be approximately 3:1

Based on a design of 2000 rooms and an estimated water volume of 2,700 m<sup>3</sup>/day (31.25 l/sec) it is anticipated that 1,350 m<sup>3</sup> (356,632.3 gals) of wastewater will be generated on a daily basis at maximum occupancy of the property. This represents the basis of design for the sewage treatment system, which will treat it to the tertiary level (suitable for use as irrigation water). The system to be incorporated will utilize an activated sludge process.

The system is designed to meet all requirements of NEPA including the 15% extra holding service capacity for contingencies.

The treatment process will be as follows:

- |                         |  |
|-------------------------|--|
| A. Pre-treatment:       | Self –Cleaning Fine Sieve<br>Grease mechanical collector<br>Regulating tank and pumps  |
| B. Primary Treatment:   | Primary Sedimentation  |
| C. Secondary Treatment: | Aeration with submersible mechanical aerators  |
| D. Effluent Polishing:  | Disinfection with: UV light and chlorine solution<br>Filtration in sand and anthracite   |
| E. Sludge Treatment:    | Anaerobic Digestion of primary sludge and<br>Aerobic Digestion of excess of biological sludge<br>And Centrifugation of digested sludge |

## **1.3.1 PRE-TREATMENT**

### ***1.3.1.1 SELF-CLEANING MESH***

---

All non-biodegradable solids more than 1 mm in size like sands, seeds, etc will be retained by a curved sieve constructed of stainless steel and with such geometry that allows the removal of solids by gravity and their collection in a box, to be sent to final disposal.

### ***1.3.1.2 GREASE TRAP***

---

In order to capture the excessive grease which is not collected by the kitchen traps, a mechanical grease collector will be installed inside a rectangular concrete tank. The grease collected will be stored in steel drums for final disposition.

### ***1.3.1.3 REGULATION TANK AND PUMPING STATION***

---

A concrete tank will be built for the purpose of regulating and homogenizing the raw water streams coming to the plant. This will receive the different qualities and volumes and will allow for a steady flow to be pumped to the process

## **1.3.2 PRIMARY TREATMENT**

### ***1.3.2.1 PRIMARY SEDIMENTATION***

---

Raw water will be pumped to a double rectangular tank (Imhoff tank) that has an upper chamber that promotes the separation of inorganic matter, mixed with some organic matter by simple gravity. The concentrated sludge will fall to the tank bottom where it will be anaerobically digested.

This system eliminates between 30 and 35 % of all the organic matter in the waste water.

### **1.3.3 SECONDARY TREATMENT**

#### ***1.3.3.1 AERATION***

---

The water, now containing 70% of the original organic matter, will pass to a rectangular concrete tank where air will be blown from the bottom by means of submersible aerators manufactured by IMPEL. This biological reactor will develop the microorganism system that will remove the rest of the organic matter and will allow for meeting the parameters defined as limits.

#### ***1.3.3.2 SECONDARY SETTLING***

---

The mixed liquor coming from the aeration tank will be conducted to a circular concrete tank where the water will be clarified through sedimentation of the biological sludge. The sludge will be concentrated in a bottom hopper by means of a mechanical system with bottom rakes that are powered by a moving bridge with peripheral traction. The tank also has dampers and a peripheral collector. Pumps will be used to remove the sludge concentrated in the bottom and send it back to the aeration tank or to the sludge digestion tank. The floating impurities and foams will be sent to the raw water regulation tank.

### **1.3.4 EFFLUENT POLISHING**

#### ***1.3.4.1 DISINFECTION***

---

The effluent will be subject to a double disinfection process in order to guarantee the efficient re-motion of pathogenous organisms (99.9%). This is accomplished with the use of a UV system which is very inexpensive to operate, and a system that de-odifies a solution of chlorine salts that provides the residual disinfectant that prevents the contamination of the storage tanks.

### ***1.3.4.2 FILTRATION***

---

In order to eliminate any solid matter that could interfere with the irrigation system, and in order to eliminate any helmynth eggs (a requirement of the Mexican Standard NOM-003-SEMARNAT-1997 used in Fiesta's Caribbean properties), a filtration system that utilizes sand and anthracite will be installed. The Mexican Standard refers to water that could come in contact with people.

## **1.3.5 TREATMENT OF EXCESS SLUDGE**

### ***1.3.5.1 AEROBIC DIGESTION***

---

The excess sludge from the biological stage will be stabilized in two rectangular concrete tanks that will have air supply from IMPEL mechanical submersible aerators. The micro-organisms will be subject to a self-destructing process that will render an inorganic, stable compound.

### ***1.3.5.2 ANAEROBIC DIGESTION***

---

The primary sludge will be stabilized in the bottom part of the Imhoff tanks that act as Anaerobic Digesters where a series of micro-organisms that live in the absence of dissolved oxygen and turn the organic matter into stable inorganic compounds.

### ***1.3.5.3 DIGESTED SLUDGE CENTRIFUGATION***

---

The digested excess sludge will be dehydrated by means of a centrifugal dehydrator which will allow the dry sludge to be used for compost making and its further use in garden improvements.

## **1.3.6 MACHINE HOUSE**

---

A closed area is required in order to house the filtration equipment, pumps, chlorine dosification, sludge dehydration and electric control equipment.

A flow chart of the proposed sewage treatment process is provided below as Figure 1-14 along with general and sectional plans. The physical structures that will comprise the sewage treatment system will be constructed in south-eastern region of the property

(see Figure 1-15). The structures will be partially underground with approximately one metre of the tanks and decanters above ground. This will facilitate ease of access and allow for the opportunity to utilize landscaping techniques to reduce any impacts on the aesthetics of the site. Table 1-2: Dimensions of Concrete Tanks and below outlines the list of tanks, buildings and their dimensions, and Table 1-3 outlines the process equipment required for the operation of the waste water treatment plant.

**TABLE 1-2: DIMENSIONS OF CONCRETE TANKS**

Stage of Treatment	Quantity	Size (m)
<b>Pre-Treatment</b>		
Solids removal tank and grease trap	1	12.3 x 3.00 x 3.70
Regulating and pumping station tank	1	13.00 x 12.30 x 3.70
equipment installation room	1	4.30 x 3.00 x 2.50
<b>Primary Treatment</b>		
Tanks	2	13.00 x 7.00 x 5.50
<b>Secondary (Biological) Treatment</b>		
Aeration tanks	2	14.00 x 7.00 x 4.50
Circular Sedimentation Tank	1	14.00 m. dia. x 4.00 m height
sludge pumping station	1	2.00 x 2.00 x 4.80
<b>Effluent Polishing</b>		
Disinfection and filtering room	1	14.00 x 6.00 x 3.00
<b>Sludge Treatment</b>		
Aerobic digestion tanks	2	10.00 x 5.00 x 4.50
<b>Machine House</b>		
Control room for filtration and sludge conditioning	1	12.00 x 6.00 x 3.00

\*\*\* Anaerobic digestion will take place in the bottom section of the primary settling tanks

**TABLE 1-3: LIST OF PROCESS EQUIPMENT**

<p><b>Pre-Treatment</b></p> <p>2 IMPEL Self cleaning meshes, opening: 2.5 mm, manufactured in electro-welded stainless steel mesh by Johnson Screens, structural components are also made of stainless steel and designed for peak capacity.</p> <p>1 IMPEL Mechanical collector for grease and oil.</p> <p>2 Submersible pumps manufactured by IMPEL, Model LD-100-104-195-W equipped with 10 HP motors. One in operation, one in stand-by</p> <p>1 IMPEL recirculation submersible pump, model LD-100-104-195-W with 10 HP motor.</p> <p>6 Electric level switches with mercury capsule, manufactured by IMPEL.</p>
<p><b>Primary Treatment</b></p> <p>2 Sludge handling pumps manufactured by Sentinel, horizontal, centrifugal, 3 HP motor.</p>
<p><b>Secondary (Biological) Treatment</b></p> <p><i>Aeration:</i></p> <p>4 Submersible mechanical aerators, manufactured by IMPEL, model AMS-50-10 with 10 HP motors</p> <p><i>Sedimentation:</i></p> <p>1 Sludge mechanical collector for circular tank, 14.00 meters in diameter, with peripheral traction system utilizing a 1 HP motor, moving bridge, rakes, perimeter discharge system and sludge trays.</p> <p>2 Submersible pumps, IMPEL, model LD-100-104-195-W with 10 HP motor.</p>
<p><b>Effluent Polishing</b></p> <p>1 Disinfection system integrated by a UV light unit formed by:</p> <ul style="list-style-type: none"> <li>2 contact channels manufactured in stainless steel</li> <li>48 UV lamps with protective cover</li> <li>2 lots of stainless steel supports</li> <li>1 control panel</li> </ul> <p>1 System for the dosification of a 5% solution of calcium hypochloride including:</p> <ul style="list-style-type: none"> <li>1 Peristaltic, dosifing pump with capacity for 367 liters/day</li> <li>1 600 liter polypropilene tank</li> <li>1lot of dry granular disinfectant (100 Kg)</li> </ul> <p>1 Pressure Filtration System consisting of:</p> <ul style="list-style-type: none"> <li>5 Horizontal cylindrical filters, 1.10m in dia. 2.50m high</li> <li>5 Loads of sand and anthracite</li> <li>2 Sets of feed and backwash pipe manifolds</li> <li>3 Basket type strainers for solids retention</li> <li>3 Horizontal centrifugal pumps, 15 HP ea. 220/440 volts</li> </ul>



**Sludge Treatment**

4 Submersible aerators IMPEL, Mod. AMS-40-7.5 with electric motor, 7.5 HP and guides

1 Centrifugal filter for sludge de-watering by Peralissi or similar

**Machine House***Electric Control*

1 Motors control center (MCC), 440 V, built in a NEMA 1 metallic cabinet, with general switch, thermo-magnetic protections and controls for all motors in the plant.

The equipment above described for

- Disinfection
- Filtration
- Sludge dehydration

**Materials**

*Hydraulic piping in Carbon Steel (outsides) and PVC for interiors.*

1 lot for raw water handling

1 lot for sludge handling

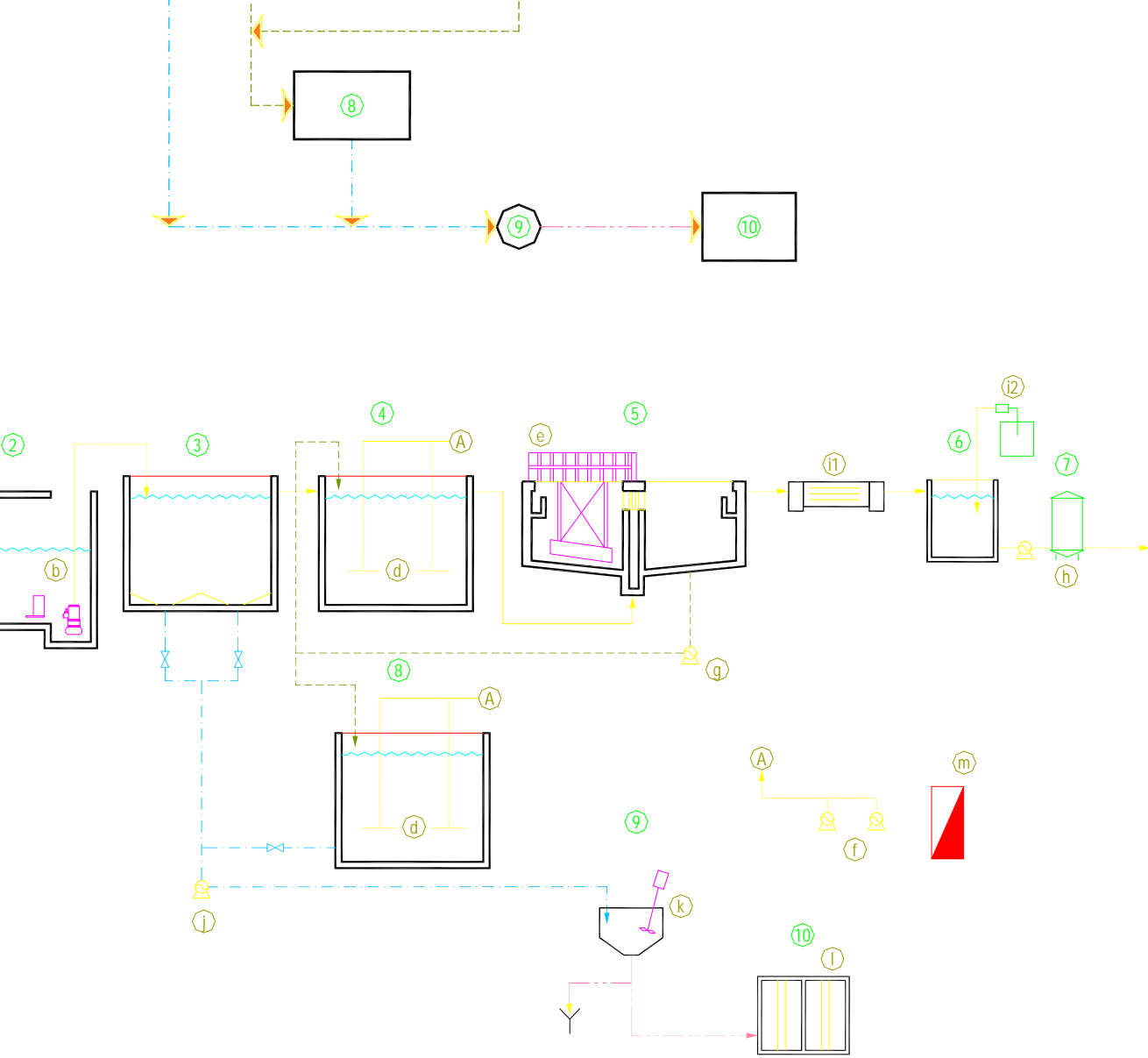
*Electric*

1 lot for power

1 lot for control

*Maintenance*

1 lot of laboratory test equipment



2	REGULATION
3	PRIMARY DECANTER (IMHOFF)
4	AEREATION
5	SECONDARY DECANTER
6	DESINFECTATION
7	FILTRATION
8	AEROBIC DIGESTION
9	ESPESADOR SLUDGE
10	SLUDGE DRYER

EQUIPMENT	
ID	DESCRIPCION
a	GREASE COLECTOR
b	INFLUENT PUMP
c	SCREENER
d	AIR DIFFUSERS
e	MECHANIC SLUDGE COLECTOR
f	AIR BLOWER
g	SLUDGE RECIRCULATION PUMPING
h	FILTRATION SYSTEM
i	DESINFECTATION SYSTEMS i1 UV LIGHT i2 CHLORINE SOLUTION
j	DIGESTED SLUDGE PUMPING
k	CHEMICAL SLUDGE THICKENER SYSTEM
l	DRYER SYSTEM
m	ELECTRIC CONTROL SYSTEM

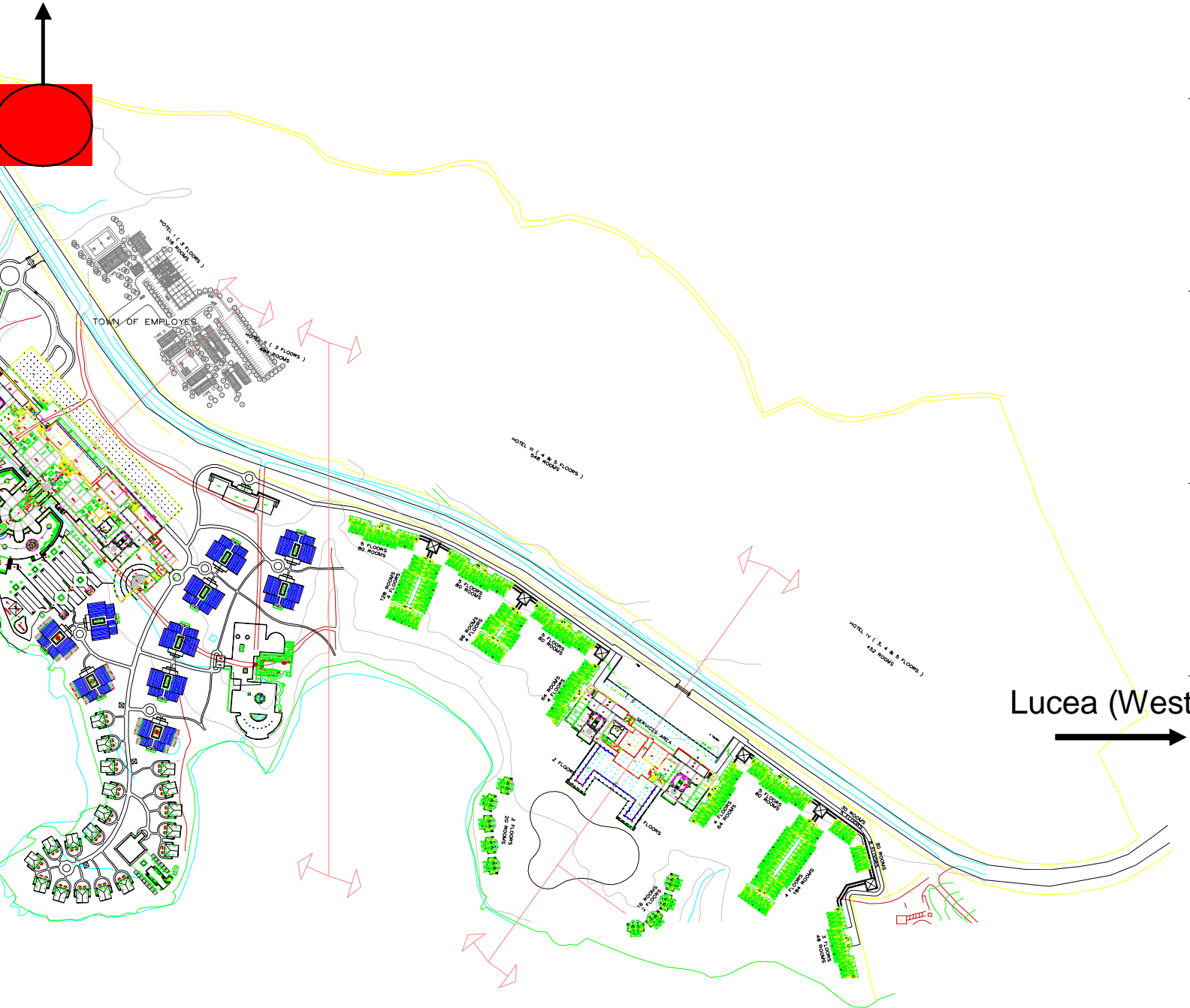
SIMBOLOGY:	
	WATER IN PROCESS
	BIOLOGIC SLUDGE
	DIGESTED SLUDGE
	DRY SLUDGE

CONT: <b>WASTE WATER TREATMENT PLANT</b>					
CLIENT: <b>HOTEL "PALLADIUM JAMAICA"</b>			LOCATION: <b>POINT STATE, HANOVER JAMAICA</b>		
No. PROYECT: <b>1787</b>	ESC: <b>1:100</b>	COT. METERS	PROYECT A.B.T.	PLAN: <b>FLOW DIAGRAM</b>	<b>2</b>
DATE: <b>NOV 24, 2005</b>		DAYMONTH YEAR <b>03 06 2004</b>	DIBUJO: <b>E.R.A.</b>		

**FIGURE 1-14: PROCESS DIAGRAM OF THE PROPOSED SEWAGE TREATMENT PLANT**

Ocho Rios Bay (East)

# Location of Waste Water Treatment Plant



NORTH

LOCATION IN PLAN

PLAN / SCHEMATIC SECTION

NOTES :

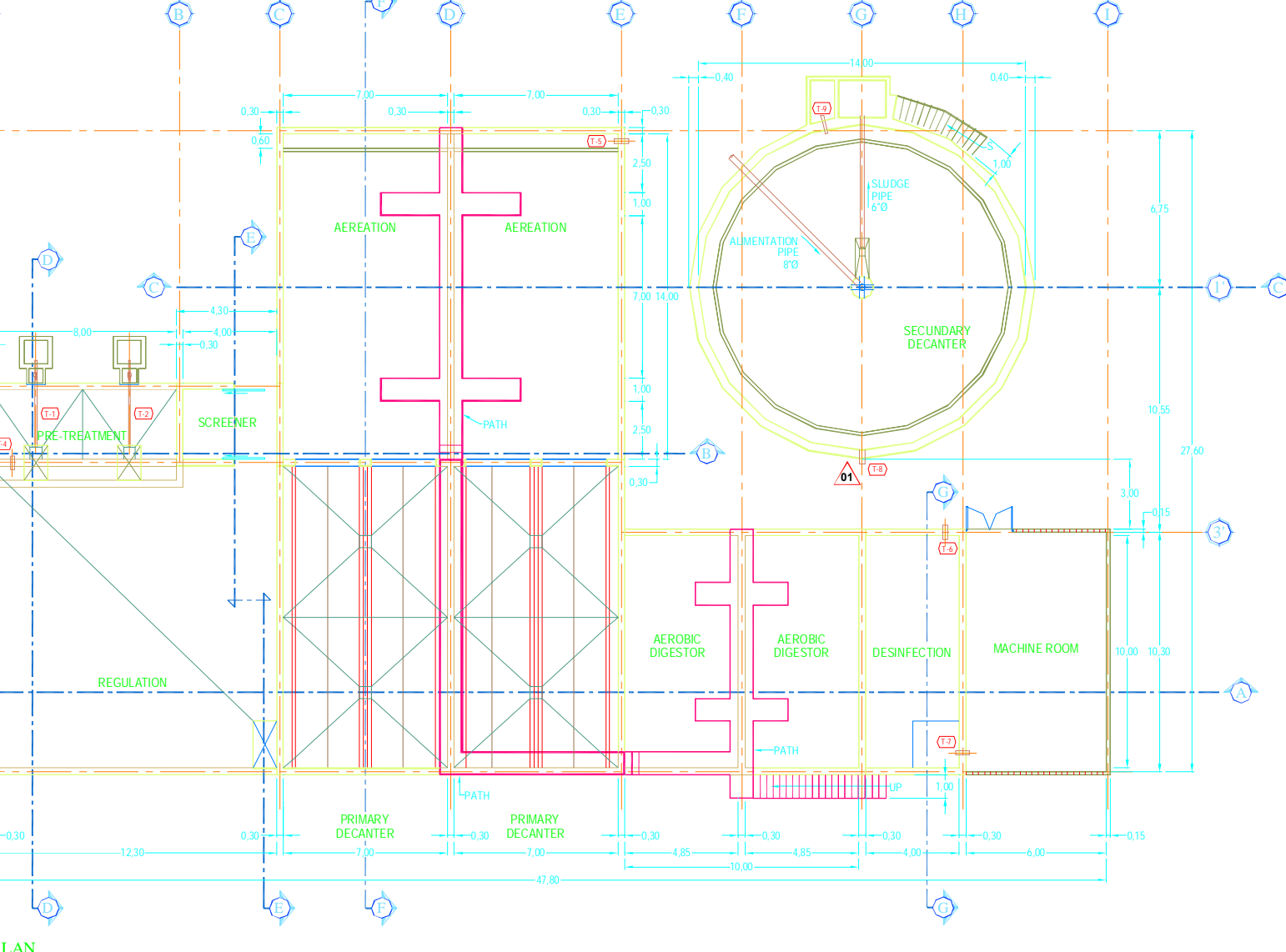
ALVARO SANS  
GABRIEL TELLEZ

PROJECT :  
HOTEL PALLADIUM  
JAMAICA

LOCATION :

PROPRIETARY :

DRAWING TITLE :  
MASTER PLAN  
- ARCHITECTURAL -  
MAIN FLOOR PLAN



LAN

**DROWNED PIPES :**

T-1	-	3'0"	-	4.70 m long
T-2	-	3'0"	-	4.70 m long
T-3	-	3'0"	-	0.60 m long
T-4	-	6'0"	-	0.60 m long
T-5	-	8'0"	-	0.60 m long
T-6	-	8'0"	-	0.60 m long
T-7	-	6'0"	-	0.60 m long
T-8	-	8'0"	-	0.60 m long
T-9	-	4'0"	-	0.80 m long

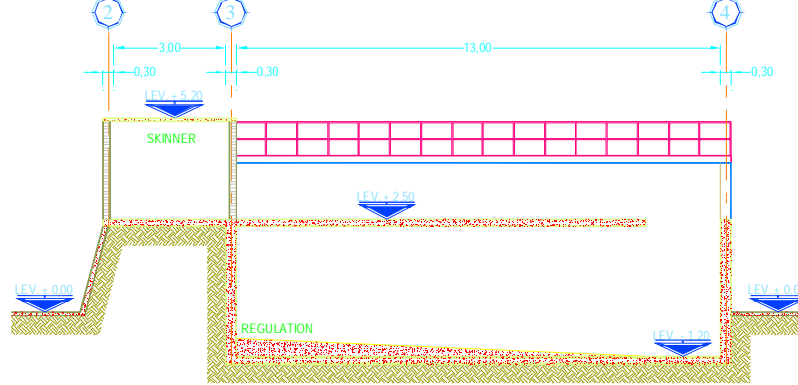
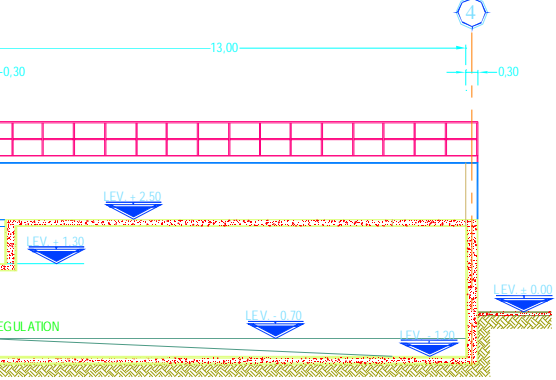
ALIMENTATION PIPES 8'0"  
SLUDGE PIPES 6'0"

**REV-01 :**

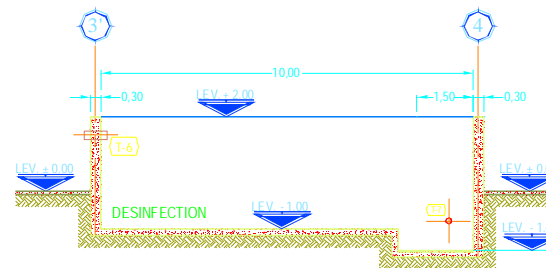
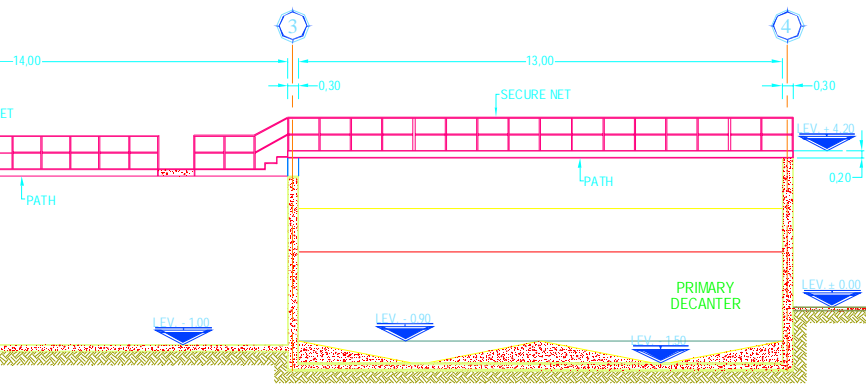
- CHANGE PIPE DIAMETER T-8 FROM 10" TO 8".

CONTENT: <b>WATER TREATMENT PLANT</b>					
CLIENT: <b>HOTEL "PALLADIUM JAMAICA"</b>			LOCATION: <b>POINT ESTATE, HANOVER, JAMAICA</b>		
No. PROJCT: <b>1847</b>	SCALE: <b>1:100</b>	MEAS. <b>METERS</b>	PROYECT: <b>A.B.T.</b>	PLAN: <b>DIMENSIONAL GENERAL PLAN</b>	<b>C-1</b>
DATE: <b>JUNE 15, 2005</b>	REV. DAY MONTH YEAR <b>15 06 2005</b>		DRAWING: <b>E.R.A.</b>		

**FIGURE 1-16: PROPOSED WASTEWATER TREATMENT SYSTEM FIESTA JAMAICA LIMITED – POINT ESTATE. GENERAL PLAN**



SECTION "E - E"



SECTION "G - G"

**DROWNED PIPES :**

T-1	3"0	4.70 m Long
T-2	3"0	4.70 m Long
T-3	3"0	0.60 m Long
T-4	6"0	0.60 m Long
T-5	8"0	0.60 m Long
T-6	8"0	0.60 m Long
T-7	6"0	0.60 m Long
T-8	8"0	0.60 m Long
T-9	4"0	0.80 m Long

ALIMENTATION PIPE	80
SLUDGE PIPES	60

CONTENT:

**WATER TREATMENT PLANT**

CLIENT: HOTEL "PALLADIUM JAMAICA"

LOCATION: POINT ESTATE, HANOVER, JAMAICA

No. PROYECT: 1847

SCALE: 1:75

MEAS: METERS

PROYECT: A.B.T.

PLAN:

DATE: JUNE 15, 2005

REV. 01 DAY MONTH YEAR 15 06 2005

DRAWING: E.R.A.

DIMENSIONAL SECTIONS

**C-3**

The sewage treatment system will be provided with back up facilities and spare parts to accommodate any contingencies that may arise. This includes the ability to remove treated effluent from the system via approved septic hauler service for appropriate disposal should the holding tank approach its capacity. It is in the best interest of the developers to construct and operate a quality sewage treatment system that will not impact negatively on the environment, tourism product, or their image. Additionally, the sewage treatment system will include a standby generator to provide emergency power. The use of the liquid effluent from the sewage treatment system for irrigation will assist in reducing the water demand of the development, provide a highly beneficial use for the treated water and afford the facility the opportunity to support a vibrant flora regardless of weather conditions at the property. It is important to note that the greater portion of the property will be landscaped and kept in a natural state through preservation of many of the existing trees.

The proposed sewage treatment system is designed to meet and in some instances exceed the regulatory standards. NEPA Sewage Effluent Guidelines are the primary regulatory guidelines utilized for this design, with consideration given to World Health Organization (WHO) standards. NEPA Sewage Effluent Guidelines for new plants constructed after 1997 are presented below:

**TABLE 1-4: WASTE WATER TREATMENT PLANT DESIGN SPECIFICATIONS**

PARAMETER	INLET WATER	TREATED WATER
pH	6-8	6.5-7.5
BOD (mg/l)	500	20
Grease and Oils	50	10
TSS (mg/l)	400	20
Total Nitrogen (mg/l)	20	10
Total Phosphates (mg/l)	40	4
Methylene Blue Active Substance - MBAS (mg/l)	20	3
Fecal Coliforms (MPN/100ml)	>109	<100
Helmynth Eggs	>2	<1
Residual Chlorine (mg/l)		1.5

\*\*use of the treated water: Re-use in gardens irrigation (In touch with people)

**TABLE 1-5: NEPA SEWAGE EFFLUENT GUIDELINES**

PARAMETER	EFFLUENT LIMIT
BOD <sub>5</sub>	20 mg/L
TSS	20 mg/L
TOTAL NITROGEN	10 mg/L
PHOSPHATES	4 mg/L
COD	100 mg/L
PH	6 – 9
FAECAL COLIFORM	200 MPN/100 ml
RESIDUAL CHLORINE	1.5 mg/L

Since the treated effluent from the sewage treatment system is slated for use as irrigation water, the final effluent quality that must be adhered to is the more stringent **Interim Irrigation Standards**, which are provided below:

**TABLE 1-6: NEPA INTERIM IRRIGATION STANDARDS**

PARAMETER	STANDARD LIMIT
OIL & GREASE	10 mg/L
TSS	15 mg/L
RESIDUAL CHLORINE	0.5 mg/L
BOD	15 mg/L
COD	<100 mg/L
FAECAL COLIFORM	12 MPN/100 ml

As required, approved flow measurement devices will be installed on the system to measure influent and effluent on the system. A complete set of “As Built” plans for the new sewage treatment system will be located at the treatment facility.

## **1.4 IRRIGATION**

The irrigation regime proposed for the facility will be largely towards the southern section of the property which will be landscaped and maintained primarily as green areas. In these areas, the distance between ground surface and the expected water table is anticipated to be no less than 5 meters above ground water level and increasing, moving to the south. This depth to groundwater and the nature of the soil (being mainly sandy loam to sandy soil on the property north of the highway and clay/limestone mix, south of the highway) will

act as a filtration mechanism that will further clean the irrigation water as it moves through the soil formation. It is not anticipated that water meeting the irrigation standard will impact negatively on ground water quality.

Irrigation will be an ongoing activity at the site. Irrigation will take place in different areas at different times both day and night, to avoid direct human contact with the water where possible. There is no defined rate of application established at this time. Most of the irrigation will be done through the use of drip irrigation with low volume sprinklers utilized in larger spaces and used mostly at night or early morning.

## **1.5 UTILITIES**

### **1.5.1 WATER DEMAND**

---

The calculations for water demand were done for a defined number of rooms based on maximum guest occupancy and their general habits. Consideration is given to the fact that guests at all-inclusive resorts tend to demand more water and generate more sewage due to the extended time spent at the resort during the course of an average day.

The project is expected to consume approximately 2,400,000.00 litres/day (634, 012.9 gals/day) of water at maximum capacity during the operational phases of the development.

It is anticipated that the source of the water will be additional to that which presently supplies the communities of Elgin Town, Point and Lucea and will come from the Bogue water supply system. Water for the facility will be taken off a relatively new water main which has been run from Great River in St. James to Lucea in Hanover, and which facilitated the upgrading work on water supply in the area.

The reserve vessels for the hotel will have storage capacity for two days (approx. 5,000 m<sup>3</sup>).



## **1.5.2 ELECTRICITY DEMAND**

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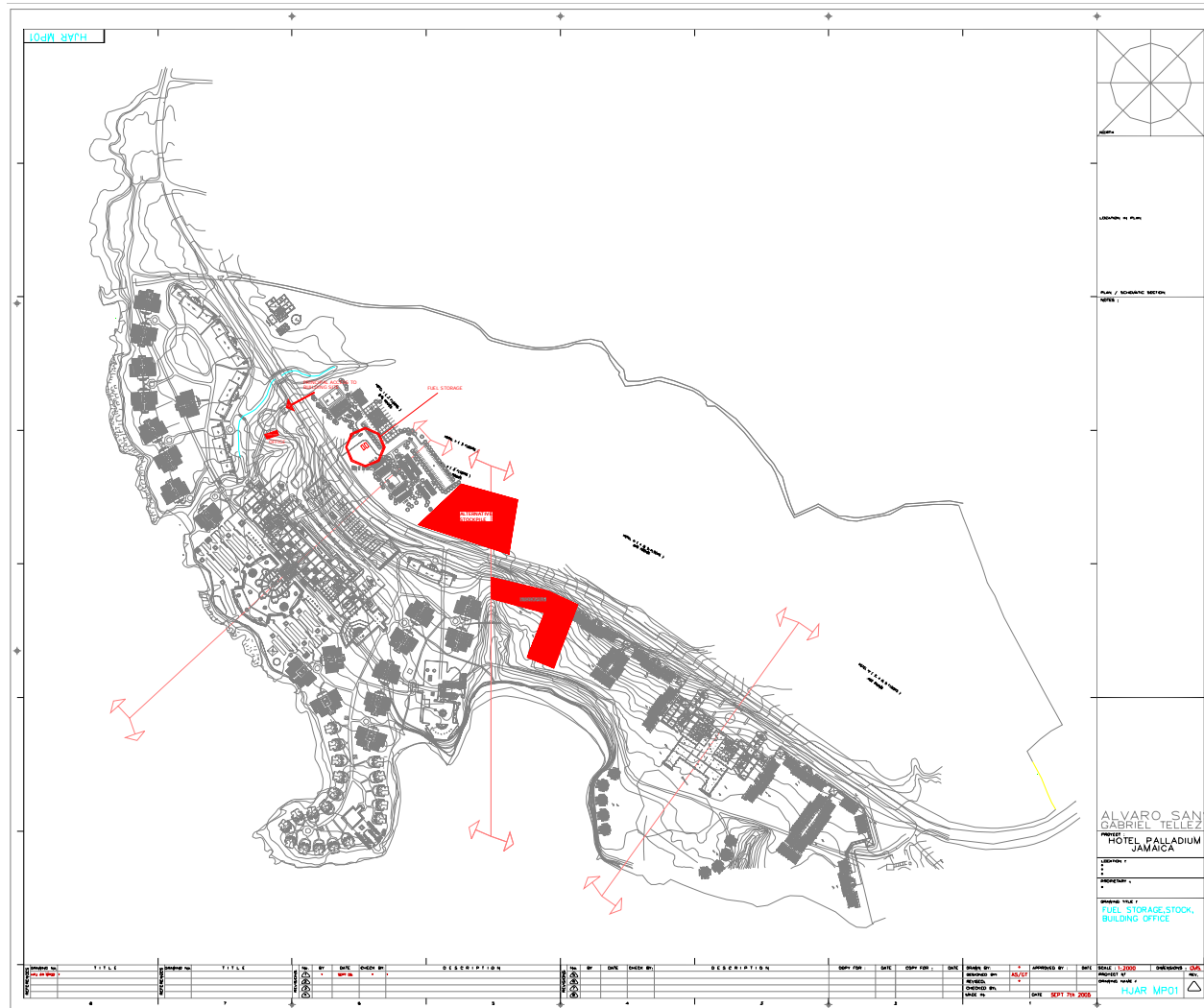
The hotel is estimated to use approximately 4,875,000 kW/month during the operational phase at maximum occupancy. Electrical power will be supplied from the Jamaica Public Service Company (JPS Co.) service lines. The facility will also be equipped with standby generators that will ensure continued facility operation (inclusive of the sewage treatment system) in the event of a power outage on the JPS Co supply.

The reception of electricity from JPS Co will be reduced by two general transformers to 13,200 V and will be distributed to the different reduction station areas of the hotel. The hotel will have eight (8) electric generators with 1150 kva each (920 kW), a total of 9200kVA (7360 kW) of power. Each generator has a 1350 HP Cummings engine, fed with diesel and cooled by air. The efficiency of each generator is 0.4 litres/kW (1 litre = 2.5 kW). 110-220 V will be distributed to each guest room and all service and common areas.

## **1.5.3 FUEL DEMAND AND FUEL STORAGE**

---

The hotel is estimated to use approximately 3.65 litres/room of gas (butane and propane) or 7300 litres/day for 2000 rooms during the operational phase at maximum occupancy. The demand for diesel will vary depending on the requirements for generation, possibly 0.4litres/kW.



**FIGURE 1-18: FUEL STORAGE LOCATIONS AND BUILDING OFFICES**

## 1.6 LAUNDRY

The laundry is expected to handle a load of 13.5 kg/guest room (2000 rooms = 27,000 kg/day). The equipment to handle this demand will have load bearing capacity of 16hr. It will be utilized in two shifts of 8 hours each. The table below outlines the general requirements for the hotel, its workers and the equipment to be put in place.

The equipment for this demand is considerate to work 16 hrs. In the next table is the necessary equipment to work in 2 shifts of 8 hours each.

**TABLE 1-7: HOTEL REQUIREMENTS AND EQUIPMENT SPECIFICATIONS**

<b>Hotel Requirements</b>	
Guest Rooms	2000
Estimated Factor kg / room	13.5
kg / day	27000
week days	7
kg / week	189000
laundry operation days	7
% of occupation	100%
Total kg / day	<b>27000</b>
Laundry daily operation hours	16
kg / hr	<b>1687.5</b>
<b>Employers Requirements</b>	
employ Rooms	340
Estimated Factor kg / room	8
kg / day	2720
week days	7
kg / week	19040
laundry operation days	7
% of occupation	100%
Total kg / day	<b>2720</b>
Laundry daily operation hours	16
kg / hr	<b>170</b>

Equipment:		
DESCRIPTION	QTY	Capacity kg
WASH MACHINE UNIMAC MOD. UF-250PV-V	17	113
DRYER. MILNOR MOD. M190S-V	9	86.26
MANGLE CHICAGO MOD. CENTURY II-3200-S-VAPOR	2	450
MANGLE CHICAGO MOD. CENTURY I-3200-S-VAPOR	1	204-227 hr
WRAPPING MACHINE CHICAGO MOD. SKYLINE 2000 S-14	2	
MANGLE CHICAGO MOD. SL-16-120 TIPO REVERSIBLE	2	55-65 hr
TOWEL WRAPPING MACHINE CHICAGO MOD. AIR		
BINDING MACHINE OF BULKS FELINS MOD. 2000-22		
LINT COLLECTOR CLEAN CYCLE MOD. WLF-725		25000 cfm
<b>Sub Totals</b>		
<b>Valet</b>		
WASHING MACHINE IN DRY UNION MOD. L-728S/V	1	12
WATER COOLANT ARCTICHILL MOD. DACVPV-3	1	3 ton
CLOTHING MARKER MOD. TAG-O-MATIC	1	
MARKER THERMOPATCH MOD. Y-140b	1	
STAIN REMOVER HOFFMAN MOD. SLB-V		
IRONING TABLE FIMAS MOD. 166.02 AS		
PANTS TOPP./MANIQUIE FIMAS MOD. 370.01		
PRESS MACHINE AJAX MOD. 554-C		
PRESS MACHINE AJAX MOD. 218-C		
PRESS MACHINE AJAX MOD. 222-C		
WASHING MACHINE UNIMAC MOD. UF-50PV6	2	23
WASHING MASHINE UNIMAC MOD. UX-100		45
DRYER UNIMAC 50-CSH	1	23
DRYER MILNOR MOD. M122S	1	54
CARRIER WHITE MOD. GADS-300		
CARRIER WHITE MOD. GADS-300		
GAS STEAMER FULTON MOD. ICS-50/GAS	1	927
INJECTION SYSTEM FULTON VT-50	1	269
PURGE SEPARATOR FULTON F-50	1	135
AIR COMPRESSOR QUINCY MOD. QTH-7.5-120	1	455

## **1.7 MODIFICATIONS TO BEACH OR FORESHORE**

The proposed development includes beach frontage which will be utilized for recreational bathing and resort activities. At this time, there are no plans to modify or place any structures on the beach or foreshore that would require a license under the Beach Control Act. If any such modification or structure is planned in the future, all applicable licenses will be obtained prior to implementation.

## **1.8 HOTEL PLOT AREA**

**TABLE 1-8: HOTEL PLOT AREA**

<b>PALLADIUM JAMAICA STAGE 1</b>			
1	CENTRAL BUILDING	25,890.18	m <sup>2</sup>
2	SPA	6,372.15	m <sup>2</sup>
3	SWIMMING POOL & EXTERIOR	23,237.60	m <sup>2</sup>
4	ROOMS	30,501.05	m <sup>2</sup>
5	SWIMMING POOL & LOBBY 'ROYAL SERVICE'	1,494.53	m <sup>2</sup>
6	PATHS	15,174.50	m <sup>2</sup>
7	COURTS (SPORT)	6,041.29	m <sup>2</sup>
<b>TOTAL</b>		<b>108,711.30</b>	<b>m<sup>2</sup></b>
<b>PALLADIUM JAMAICA STAGEA 2</b>			
1	CENTRAL BULDING 2	13,506.45	m <sup>2</sup>
2	ROOMS	21,245.62	m <sup>2</sup>
3	PATHS	10,282.61	m <sup>2</sup>
<b>TOTAL</b>		<b>45,034.68</b>	<b>m<sup>2</sup></b>
<b>SUPPORT VILLAGES</b>			
1	PATHS & EXTERIORS	6,755.90	m <sup>2</sup>
2	ROOMS	2,332.80	m <sup>2</sup>
3	SERVICES	1,228.13	m <sup>2</sup>
4	RECEPTION AREA, HUTS	456.55	m <sup>2</sup>
<b>TOTAL</b>		<b>10,773.38</b>	<b>m<sup>2</sup></b>

<b>TOTAL</b>		<b>164,519.36</b>	<b>m<sup>2</sup></b>
<b>CONSTRUCTION IN SQ M PALLADIUM JAMAICA, STAGE 1</b>			
1	CENTRAL BUILDING	43,646.88	m <sup>2</sup>
2	SPA	6,372.15	m <sup>2</sup>
3	SWIMMING POOL & EXTERIORS	23,237.60	m <sup>2</sup>
4	ROOMS	101,153.03	m <sup>2</sup>
5	SWIMMING POOL & LOBBY 'ROYAL SERVICE'	1,494.53	m <sup>2</sup>
6	PATHS	15,174.50	m <sup>2</sup>
7	COURTS (SPORT)	6,041.29	m <sup>2</sup>
<b>TOTAL</b>		<b>197,119.99</b>	<b>m<sup>2</sup></b>
<b>CONSTRUCTION IN SQ M, PHASE 2</b>			
1	CENTRAL BUILDING 2	25,219.68	m <sup>2</sup>
2	ROOMS	86,720.15	m <sup>2</sup>
3	PATHS	10,282.61	m <sup>2</sup>
<b>TOTAL</b>		<b>122,222.44</b>	<b>m<sup>2</sup></b>
<b>CONSTRUCTION IN SQ M, SUPPORT VILLAGES</b>			
1	PATHS & EXTERIORS	6,755.90	m <sup>2</sup>
2	ROOMS	6,998.40	m <sup>2</sup>
3	SERVICES	1,228.13	m <sup>2</sup>
4	RECEPTION, HUTS	456.55	m <sup>2</sup>
<b>TOTAL</b>		<b>15,438.98</b>	<b>m<sup>2</sup></b>
<b>TOTAL</b>		<b>334,781.40</b>	<b>m<sup>2</sup></b>

# **ALTERNATIVE ANALYSIS**

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## **2 ALTERNATIVE ANALYSIS**

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In considering the development options, three alternatives can be exercised. These are:

1. The No Action Alternative
2. The Proposed Development
3. The Proposed Development with modifications
4. Proposed Development in another location

### ***2.1 THE NO ACTION ALTERNATIVE***

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The selection of the “No Action” alternative would mean the discontinuation of project designs and result in the site being retained in its existing form. There are physical, biological and socio-economic implications of this alternative.

Physically, the site is unlikely to undergo any major changes from its present condition. Biologically, the vegetation present on the site is unlikely to be severely affected, other than the potential for uncontrolled growth of weeds, bushes and trees introduced by avifauna, wind or other means. Unless the vacant lot is maintained, this could result in an eyesore and a possible venue for illicit and otherwise objectionable activities.

The “No Action” Alternative is likely to have the greatest implications on the socio-economic environment of the area and surrounding communities. Due to the proposed quality of the development it is anticipated that it would provide a major opportunity for employment, foreign exchange revenue, benefits associated with the construction industry and potentially significant business opportunities for existing and new tourism support businesses. In addition, a development of this calibre will add to the islands’ ability to market itself to visitors from markets previously under represented through previous marketing activities. It will also fuel the growth and development of the Lucea area, thereby, alleviating sprawl and continued migration of people to the burdening tourism centres of Montego Bay and Negril. If this alternative were adopted, the developers would need to find an alternative site for the development or decide to develop the product outside of Jamaica.



## **2.2 THE PROPOSED DEVELOPMENT**

This alternative would see the construction of the development as proposed by the developers, and as outlined in this EIA document. This option has good support (based on results of socio-economic survey) by the persons who would be most affected by its implementation, i.e., residents within Point Estate, Elgin and Johnson Towns and the greater Lucea area. Therefore, community support is anticipated for the development.

This alternative will provide positive benefits to the communities and Jamaica's tourism product. This includes benefits such as employment opportunities, foreign exchange earnings, increased property values and benefits to ancillary supporters/dependents of the tourism industry. In fact, the total investment is estimated at upwards of US\$60,000,000. If approved, construction at the facility is scheduled to last approximately 18 months, and will provide employment for an average of forty (40) individuals during pre-construction, eight hundred (800) tradesmen and labourers during construction, which at its peak will increase to approximately twelve hundred (1200) workers and approximately eight hundred (800) employees during the operational phase. Additionally, the multiplier effects to the construction and support industries during this period are likely to affect a much larger number of persons.

The proposed project will also make a positive contribution to social infrastructure, overall residential development, upkeep and renewal of the residential community. The proposed development is being designed and built to meet or exceed local and international standards and regulations. A key benefit also is the installation of a tertiary level sewage treatment facility that will produce an effluent suitable for use as irrigation water on the facility while meeting, and in some instances exceeding, standards for coastal water quality.

## **2.3 THE PROPOSED DEVELOPMENT WITH MODIFICATIONS**

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If there are issues concerning the project that may be enhanced, changed or modified to increase the acceptability of the project, then these issues should be considered. At this time based on communication with residents of surrounding communities, it appears that there are several issues that once resolve satisfactorily whether through modification or compromise would further increase support for the development. These include but are not limited to:

- Guarantees that the sewage treatment system will treat wastewater to be used for irrigation to the tertiary level (the system has been designed to achieve irrigation standards which are more stringent than discharge standards)
- Utilization of different sewage treatment options (due to the availability of space at the proposed site, very few sewage treatment technologies could be implemented that would treat to the same level, with the low operational and maintenance costs and reliability anticipated for this system)
- impact on the existing water supplies in the area
- Established lines of communication with the possibility of a liaison officer between the developers and the community
- Aesthetics, particularly the timely removal of zinc fencing surrounding the site and construction of an aesthetically pleasing fence.

Some of these concerns will not exist on project completion e.g. water supply. All other issues are easily resolvable through either modification or compromise and we do not foresee these issues resulting in disapproval of the development by interested community and regulatory agencies. The developers will work with the communities and residents to design, construct and operate a quality facility that will be the pride of all involved or partake in its operation.

This alternative retains the same positive benefits as with maintaining the proposed development option.

## **2.4 THE PROPOSED DEVELOPMENT IN ANOTHER LOCATION**

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Other locations were considered in conjunction with the proposed Point, Hanover location for implementation of this project. However, the Point property offered the following advantages over other locations considered:

- Size of available land was desirable
- Beach and waterfront location was ideal with beautiful white sand beach and high quality marine environment
- Size of property allowed for inclusion of a tertiary level sewage treatment system with capability to treat to a level satisfactory for use as irrigation water

No other location was able to offer the comprehensive package of available land, size, natural resources and access. As a result, no location that was more suitable or amenable than the Point site was identified in the Lucea area.

The recommended alternative is the “Proposed Alternative” because it recognizes the viability and need for the proposed development, is designed to address environmental issues and concerns, meets or exceeds all local regulatory requirements and supports communication and close relations during all stages of the development between the developers and the surrounding communities.

# **EXISTING ENVIRONMENT**

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## **3 EXISTING ENVIRONMENT**

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The project site is located in a coastal area at Point Estate, Hanover in close proximity to residential communities of Elgin Town and Johnson Town. The site comprises 80.94 hectares (200 acres) and is mostly undeveloped real estate. The old north coast highway originally ran along the coastline through this property but has been moved further inland in the realignment process of the North Coast Highway Project. As a result, it has been allowed to re-vegetate along the coast under natural conditions. The vegetation communities observed, are a remnant of the original vegetation, and only contain a portion of the species usually found in a typical coastal community. This area is typical of the Dry Limestone Forests of the North Coast of Jamaica. This area provides habitats that encourage diversity among species promoting Jamaica's floral and faunal endemism.

### **3.1 PHYSICAL ENVIRONMENT**

#### **3.1.1 CLIMATE**

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The parish of Hanover receives an average of 127-178cm of rainfall per year mainly during the rainy period, between the months of May and November. The driest period occurs from January through March, with less than 127 mm (5") per month.

Temperatures are relatively constant throughout the year, but range from 21 °C to 32 °C during the hottest months and 18 °C to 28 °C during the cooler months.

Relative humidity in this area averages approximately 73% throughout most of the year but trends upward during the warmer summer months typically not exceeding 90% for extended periods.

Specific wind data was not available for the project area. The closest available data that could be considered reliable was from the Sangster International Airport in Montego Bay which is approximately 45km (28 miles) to the east of the project area. It is assumed that wind patterns and influences at the project site are similar to those in Montego Bay. This means that northeast trade winds occur year round with north-easterly winds predominant

during the daytime ranging from calm up to speeds in excess of 40 km/hour, average speed is estimated to be 25 km/hour. At night, the wind is primarily southerly moving across the land and out towards the sea. Wind speed during the night ranges from calm to over 20 km/hour, with the average estimated to be 15 km/hour.

**TABLE 3-1: PREVAILING WIND DIRECTIONS ANNUALLY FOR POINT ESTATE, HANOVER<sup>3</sup>**

MONTHLY PERIODS			
December – February	March – May	June – August	September - November
NE – ENE	E	E-ESE	E - SE

Hurricanes are a serious seasonal threat from June to November; since 1886, 21 hurricanes have made landfall in Jamaica, while over 100 have passed within 240 km (150 miles) of the island. Tsunamis are also a major risk.

Considerations have been given to issues related to storm water and potential for erosion during the construction and operational phases of the development. As such, a storm water management system, involving the use of drains and absorption pits (French drains) has been recommended.

### 3.1.2 TOPOGRAPHY

#### 3.1.2.1 GENERAL AND BEACH TOPOGRAPHY

Elevations at the site increase gently from sea level along the shoreline to a maximum of 22.1 metres above sea level along the boundary with the North Coast Highway. The soil at the shoreline is a part of the Hanover Shale Formation, and consists of sandstone, shale with clay deposits. This soil type tends to be soft and rubbly at depth, so care will be taken in the designs to guarantee structural stability particularly on the slopes. There is a potential for erosion of soil materials during periods of moderate to heavy rainfall when vegetation is removed during construction. This potential is acknowledged and will be mitigated during such events.

Along the beach, the substrate depth ranged from 0 cm to 10 cm, and consists of fine - medium carbonate sand grains. This suggests storm surge activity (less than 50 years) at the site has been minimal since there wasn't much coarse grain material such as angular

<sup>3</sup> Lucea Foreshore Road EIA, ESL, 1997

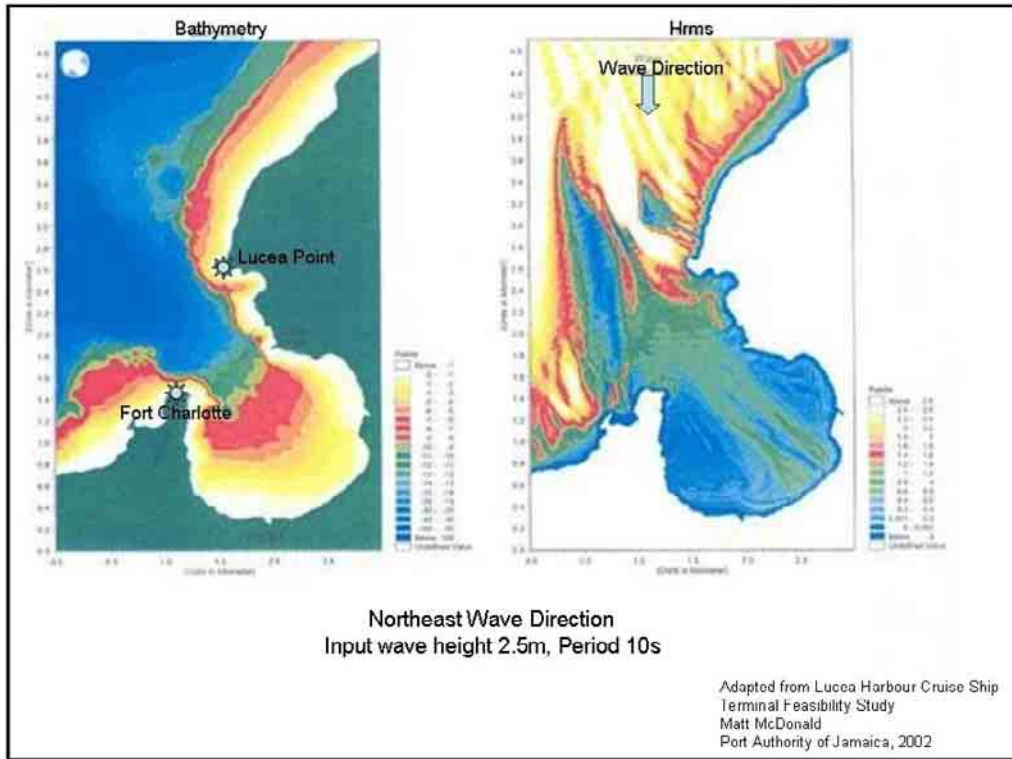
pieces of coral at the site. The site is not in a major earthquake zone. Only three earthquakes events of intensity greater than six (VI; Modified Mercalli Scale) have been reported in the area between 1897 and 1978.

It is not perceived that the present topography and geology of the coastal lowland requires any special considerations prior to a development such as the one proposed being implemented. The elevated property however, may require soil stability test to be done as it sits on the Hanover Shale Formation. This has been recommended to the developers and will be added as an addendum to this report. As mentioned, the developers will incorporate erosion controls during the construction and operational phases.

### **3.1.2.2 BASIN BATHYMETRY**

The sea basin in the vicinity of point extends to a depth of 24m on a gently sloping contour.

Preliminary studies on wave propagation in the Lucea Harbour, using modelling software, have shown that though potential for impact is low; there still exists storm surge potential along the eastern side of the Harbour from Northers (McDonald, 2002).. This is due in large part to the less developed reef system at Point. The eastern side of the Lucea Harbour is not as protected as the western side from inputs of wave height of 2.5m for a period of 10s. Wave heights of 1.4m to 1.6m are possible from refraction around Lucea Point.



**FIGURE 3-1: NORTH EAST WAVE DIRECTION AT POINT, HANOVER**

### 3.1.3 GEOLOGY

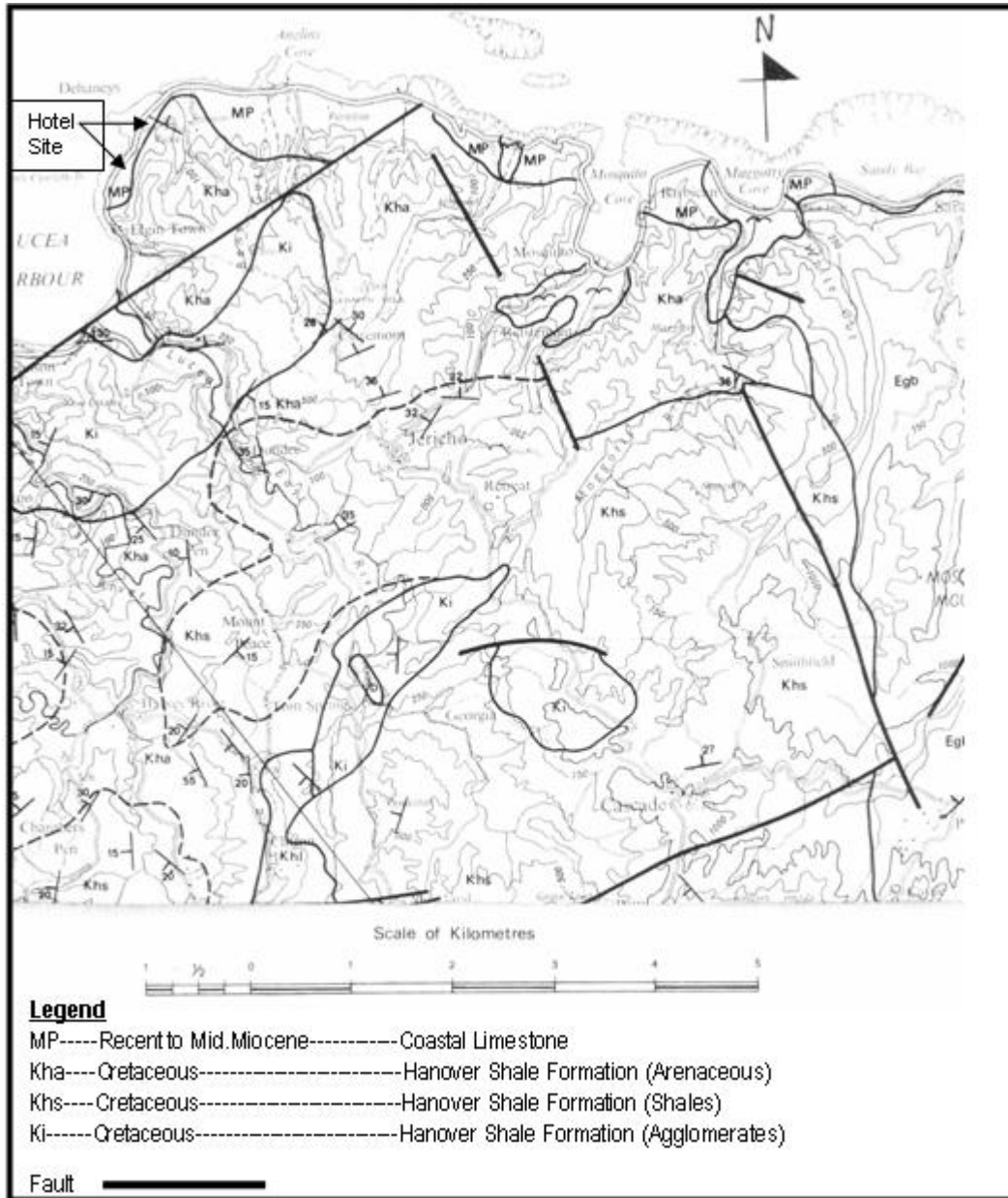
The island of Jamaica is subdivided into structural blocks based on fault induced escarpments. There are three (3) blocks with the Hanover Block being the largest. Within the Hanover Block there are three (3) sub-blocks. They are:

1. Dolphin Head-Burnt Savanna sub-block
2. Cave Valley-Moreland Hill sub-block; and
3. The Central sub-block.

Western Jamaica, and in particular Hanover, is comprised of a sequence of Cretaceous sandstones, shales and conglomerates overlain unconformably by Tertiary-Pleistocene shelf edge to deep water limestones which are in turn overstepped by Pleistocene-Recent elevated reefs. The Cretaceous rocks outcrop in inliers the largest of which is the Hanover Inlier and they are encircled sometimes only partially by the younger limestones.



Structurally the Cretaceous sequence exhibits a dominantly northwestern dip averaging less than 35 degrees. The Cretaceous rocks represent the northern limits of a faulted anticline with the fold axis passing through Cash Hill south of Lucea. The hotel site lies on the edge of the northern limb of the anticline (Plates 1 and 2 below).



**FIGURE 3-2: GEOLOGY MAP OF HANOVER ILLUSTRATING LUCEA AND AREA OF DEVELOPMENT<sup>4</sup>**

<sup>4</sup> Information courtesy of the Water Resources Authority (WRA) of Jamaica

The proposed hotel site, located on the eastern side of the Lucea Harbour and along the harbour coastline, is underlain by a lithologically contrasting unit of arenaceous material (Kha) with sandstones, conglomerates and interbedded shales. This formation is a part of the Cretaceous age Hanover Shale Formation. The Hanover Shale Formation is an extensive outcrop of interbedded shales and sandstones stretching from Mosquito Cove in the east to Haughton Court just west of Lucea. The road cut along the Elgin Town-Lucea main road to the east of the site shows the rock types with differential weathering as the softer shales weather out leaving the more resistant sandstones (see Plate 3-1 and Plate 3-2).



**PLATE 3-1: GEOLOGICAL FORMATIONS ALONG HIGHWAY**



**PLATE 3-2: GEOLOGICAL FORMATIONS NEAR BEACH**

To the west of the Cretaceous Hanover Shales is an outcrop of the younger Coastal Limestone (MP), which is a raised reef. This reef fringes the eastern coastline of the harbour and extends eastwards around the “Point” (Dehaneys Point) to Paradise. The raised reef is a part of the Recent to Middle Miocene age Coastal Limestone Group.

To the south and southeast of the site are the agglomeratic rocks (Ki) also of Cretaceous age and apart of the Hanover Shale Formation. The exposures in the agglomerates show them to be composed of a matrix of andesitic composition in which are embedded angular fragments and volcanic ejectamenta

To the south of the site and passing through Dry Hill, Johnson Town and Elgin Town is a southwest-northeast trending fault with the north side of the fault (on which the site lies) being the downthrown side. No seismic activity is known to be associated with this fault.

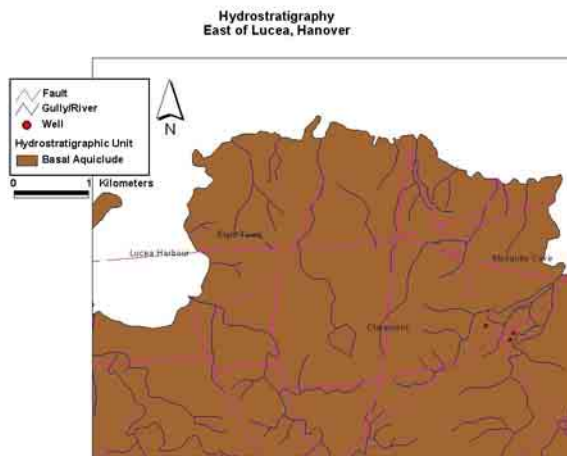
The Hanover Shale Formation weathers to give an alluvium consisting of unconsolidated clayey sand and clay that covers the “Point” area and the hotel site.

### 3.1.4 HYDROLOGY

Lucea and environs are located within the Great River Hydrologic Basin. The Great River Hydrologic Basin occupies an area of 798 km<sup>2</sup>. The basin is subdivided into five (5) sub-basins viz. Lucea River, Flint River, Great River, Montego River and Ironshore. There are six (6) hydrostratigraphic units within the basin including alluvium aquiclude, coastal aquiclude, basal aquiclude, coastal aquifer, limestone aquiclude and limestone aquifer. Only the basal and coastal aquicludes of the 6 hydrostratigraphic units outcrop within the Lucea area and at the proposed site.

A hydrostratigraphic unit is a geologic formation (or series of formations), which demonstrates a distinct hydrologic character. Rock formations are characterized as either aquifers or aquicludes. Those formations with sufficient permeability to support perennial well and/or spring production were classified as aquifers. Surface water is the main potential of aquicludes because of their low permeability.

The proposed hotel site is located within the Lucea River hydrologic sub-basin. The site is underlain by Cretaceous age rocks of the Hanover Shale Formation and the raised reef of the younger Recent to Mid. Miocene Coastal Limestone Group. The hydrostratigraphic units determine the hydrology of the site and surrounding area. Within the Lucea River sub-basin aquicludes outcrop over 88% of the area and the primary water resources potential would be surface water. The hydrostratigraphic map below shows that the area east of Lucea consists primarily of basal aquiclude.



**FIGURE 3-3: HYDROSTRATIGRAPHY MAP OF EAST OF LUCEA, HANOVER<sup>5</sup>**

<sup>5</sup> Information courtesy of the Water Resources Authority (WRA) of Jamaica

The basal aquiclude is made up of the volcanic and volcani-clastic rocks of Cretaceous age such as the Hanover Shales. The Coastal Limestone is also classified as an aquiclude.

While the water resources potential is surface water there are no perennial surface water sources within the site or any area close to the site. A number of seasonal gullies, which carry water only in the rainy season, run south to north to the east of the site. The closest perennial surface water sources are the Lucea East River (Kew) and the Lucea West River (Riley) and these have a low reliable yield with no potential for development as water supply sources.

The potential for groundwater is non-existent as the aquicludes are of low permeability and do not support perennial well or spring yields. No successful wells have been drilled into the basal aquiclude.

The lack of surface and ground water potential in the Lucea River sub-basin has meant that water supply for the Lucea area has to be brought from the Great River to the east and from the Orange River Bluehole at Logwood to the west of Lucea. Water supply for the proposed hotel would have to come from the NWC's Great River-Lucea pipeline recently commissioned (November 2004) and transmitting water sourced from the Great River.

The lack of any water resources potential under or near to the site means that the pollution of water resources is not a consideration. However runoff from the site and possible wastewater discharges into the coastal zone will be a significant consideration.

### **3.1.5 WATER QUALITY ANALYSIS**

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The property has one seasonal pond in the lowland coastal zone and one cattle watering hole in the elevated coastal zone. No rivers or streams pass through the property. Several drainage features were found in the lowland coastal zone, however, they were all associated with the old coastal highway, such as box culverts. In the elevated coastal zone, the steeper terrain rendered few natural drainage features that were vegetated.

Water samples were collected from the pond as well as from the coastal waters near the beaches, to give an indication of the quality of the water for bathing. The water samples

were collected in sampling containers provided by the Scientific Research Council's Analytical Services Department. Visually, the water was clear up to a depth of 20m with no obvious abnormalities seen. The samples were collected and the containers placed in an insulated cooler filled with ice for transport to the laboratory.

No polluted water streams were found that entered the coastal waters from the site or adjacent to the site.

### 3.1.5.1 ANALYTICAL RESULTS

**TABLE 3-2: RESULTS OF WATER QUALITY ANALYSIS CONDUCTED ON SAMPLES COLLECTED FROM THE COASTAL WATERS AT POINT ESTATE, HANOVER**

PARAMETER	ANALYTICAL METHOD	RESULTS	NEPA STANDARD
pH	SMEW Method 9221	7.5 - 7.9	6.5 – 8.5
TDS (mg/L)	SMEW Method 2540C	<37,700	
DO (mg/L)	SMEW Method 2540E	<8.3	
Nitrate (mg/L)	HACH 8039 & 8171	<10.56	10
Total Phosphate (mg/L)	HACH 8048	<0.07	5.0
Faecal Coliform (MPN/100ml)	SMEW Method 9221	<3	< 100
Total Coliform (MPN/100ml)	SMEW Method 9221	<3	<500
Turbidity (FTU)	HACH 8237	4	

The results of the water quality analysis indicate that water quality in the area at the time of the sampling event was in excellent condition. No parameters were observed above the NEPA standards. It is understood that water quality in the marine environment is highly variable, but this analysis provides an understanding of the general water quality in the area, which is very good. The results from our marine assessment corroborate that the marine environment in the area is in a very healthy state, which can only benefit from good water quality.

The proposed development is not designed to have any negative impacts on the marine environment. No treated sewage will be discharged into the sea; the contingency for emergency removal of sewage is to utilize licensed septic service contractors.

### 3.1.6 NOISE ASSESSMENT

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A noise level assessment was conducted at the site to determine background noise levels along the boundaries of the property. Noise levels were measured using a calibrated Quest Technologies Model 2800 Impulse Integrating sound level meter. The meter is capable of accurately measuring decibel levels from as low as 20 dB to as high as 140 dB at varying rates of response. Results of a noise level assessment undertaken at the site to establish background noise levels indicated the following:

- Background noise levels along the property boundary with Molasses Factory ranged between 40db to 68db
- Noise levels measured along the property boundary with the North Coast Highway ranged between 36db to 63db
- Noise levels measured along the southern property boundary away from the North Coast Highway road ranged from 45db to 84db

The NEPA standard for acceptable noise levels in residential communities is 70 dB, while the results of the noise assessment indicated levels within the range 36db to 84 db. This indicates that, at present, the noise level in the community (for the most part) is well within the acceptable limits.

The higher noise levels obtained along the boundary with the highway is likely due to vehicular activity along the highway. The use of horns on vehicles will cause elevated readings. These types of noise are usually not perceived as disturbances by persons in proximity, as they are a part of normal activities. However, noise created by loud voices or the use of heavy equipment, such as is likely during the construction phase of the development, although it may be within acceptable limits, may be considered disturbing to residents, as it is of an intrusive nature. The developers plan to implement a monitoring program during the construction phase of the project that will include monitoring of noise and dust levels to guarantee that the comfort of residents in the community is appreciated.

### **3.1.7 AIR QUALITY**

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No ambient air quality assessment was conducted. The distance from any major polluters as well as the present vegetated state of the site suggests there is little or no potential for a significant breakdown in ambient air quality of the area. The prevailing winds at the proposed site are from the northeast, typical of the north coast. This wind direction would effectively reduce the potential for nuisance even more by taking any potential wind blown nuisance away from neighbouring communities and the proposed development. The geography of the area also limits the potential for nuisance with wind direction sweeping across the property and Lucea Harbour.

### **3.1.8 NATURAL HAZARD VULNERABILITY**

#### **3.1.8.1 HURRICANE ACTIVITY**

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Using Sangster International Airport in Montego Bay as a reference point location: 18.50N 77.92W, all recorded tropical storm and hurricane activity over a period of 100 years are considered to estimate any trends related to the hurricane activity and the return period of such activities to the island<sup>6</sup>. This can be done confidently as Jamaica is a small island and is likely to be affected wholly regardless of the point of approach of a tropical depression or storm system.

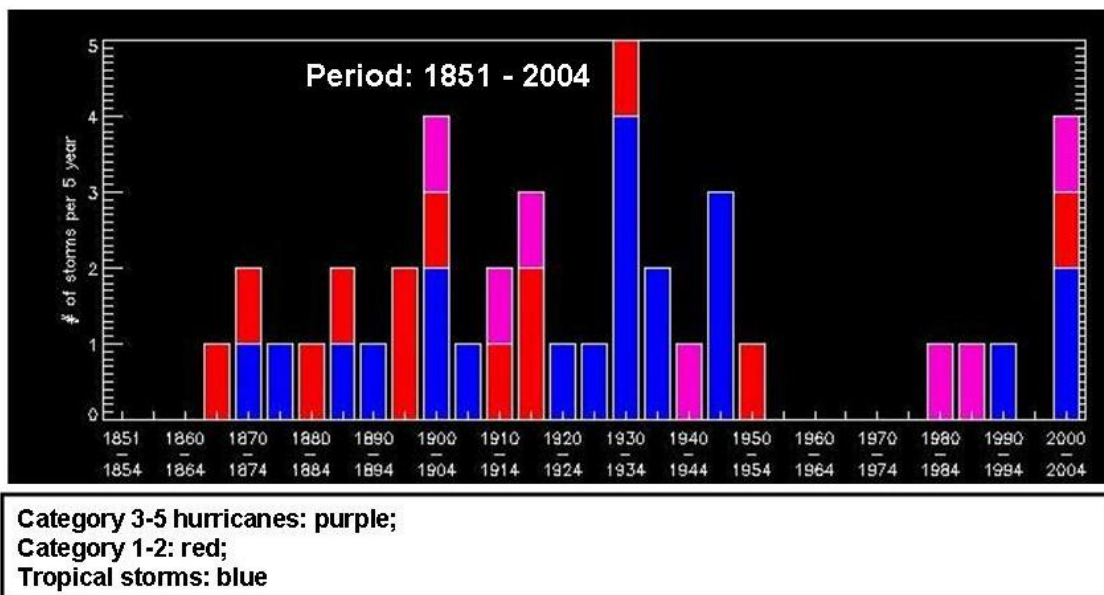
So far this year, there have been two (2) hurricanes within a two-week period that have affected the island. Both considered big hurricanes (Category 3 and above). One passed to the south and one to the north of the island. No significant storm surge activity was recorded along the north coast that affected the property.

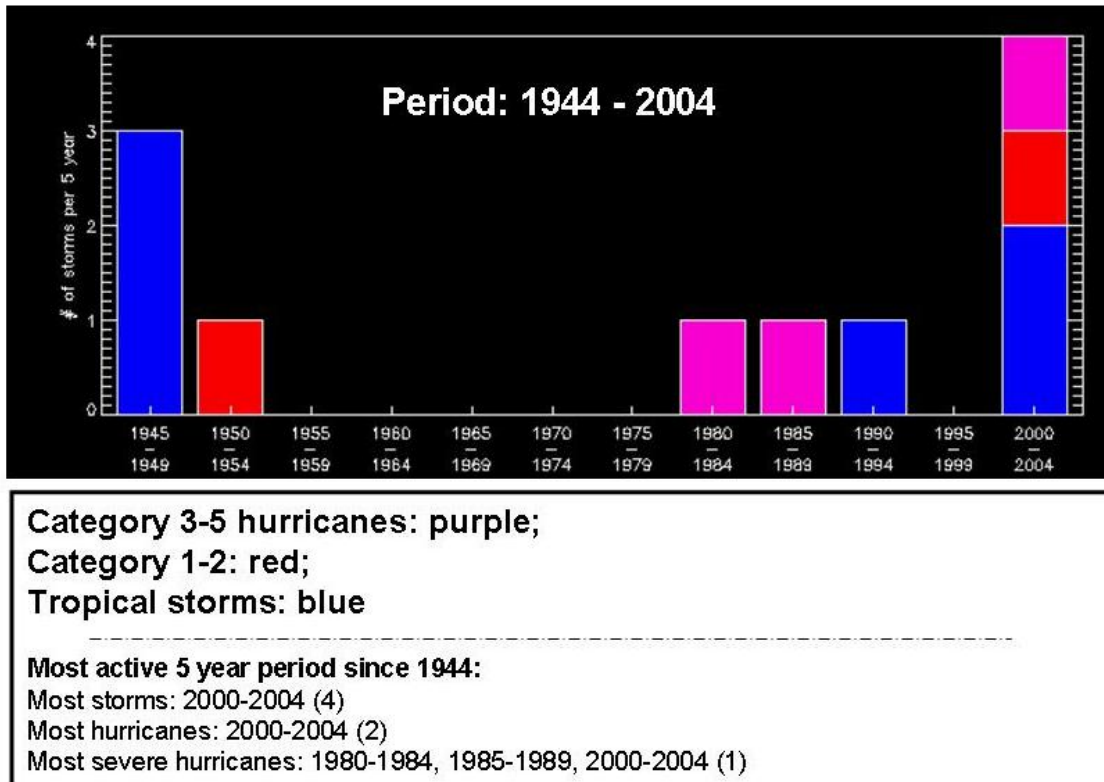
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<sup>6</sup> [Caribbean Hurricane Network](http://stormcarib.com/climatology/MKJS_5year.htm).  
[http://stormcarib.com/climatology/MKJS\\_5year.htm](http://stormcarib.com/climatology/MKJS_5year.htm) Accessed July 25, 2005



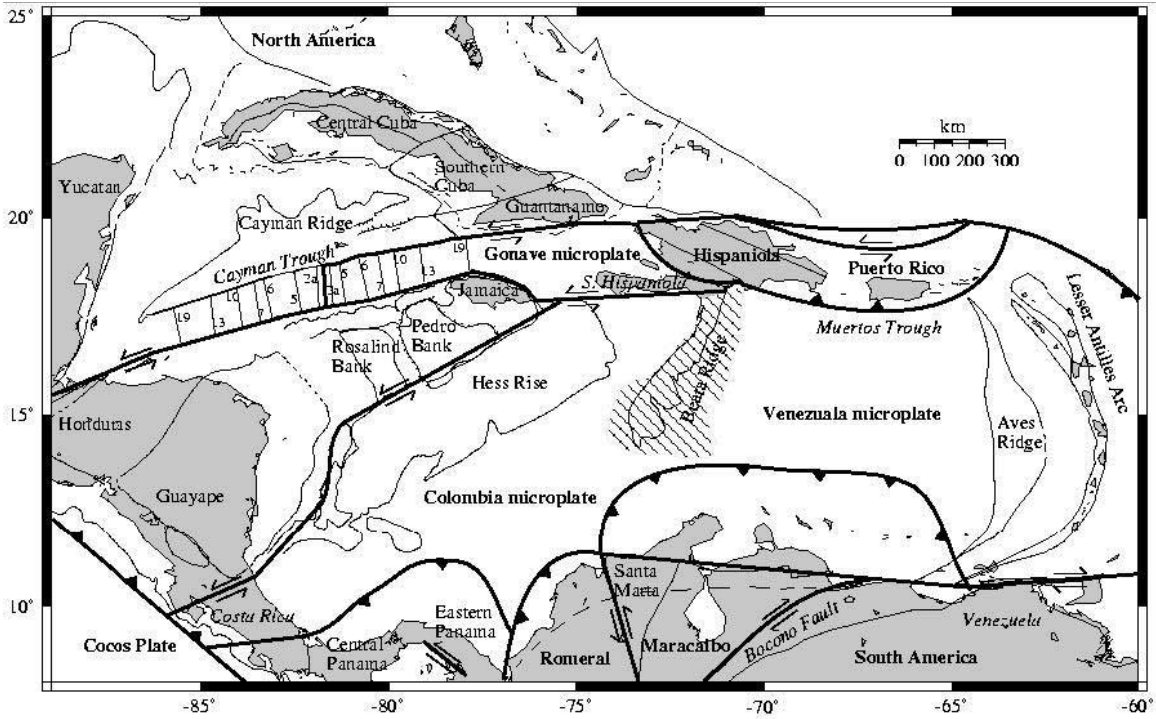
Analyses of tropical systems passing within 60nm (= 60mi.) of the island per five year period is shown below. Latitude/longitude coordinates (18.50N, 77.92W) used is for Sangster International Airport, one of the island weather stations. In the graphs below the number of tropical systems passing by are plotted for each 5 year period since 1851 and since 1945. This can show if there are more storms lately or which 5-year period in the last 150+ years was most active. Those tropical systems reaching hurricane strength are in red, and the 'big ones' (severe hurricanes, or category 3 and up) in purple. A summary is shown below the graph (Period 1944 – 2004) showing which 5-year period was most active, with the number of storms during that period between brackets.





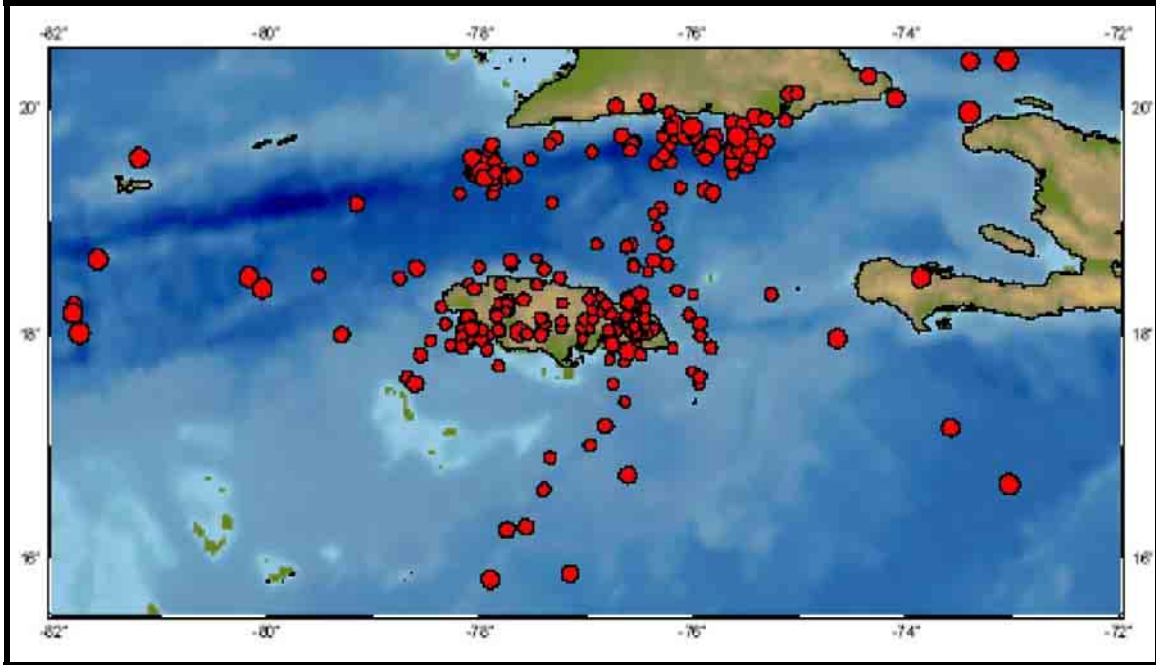
### 3.1.8.2 SEISMICITY

Jamaica lies in the seismically active northern plate boundary zone of the Caribbean Plate (Draper et al., 1994 and Figure 3-4). High magnitude earthquakes originating from as far away as the south coast of Cuba may be felt in Jamaica. For example the Cabo Cruz earthquake of magnitude 6.9 which occurred in May 1992 was felt with intensity 4 in Kingston, Jamaica. The 1993 earthquake of magnitude 5.4 which originated in Jamaica was felt in Cuba with intensities of 3-4. No damage was reported in either case from the distant country (pers. comm. M. Grandison).



**FIGURE 3-4: TECTONIC PLATES IN THE CARIBBEAN REGION**

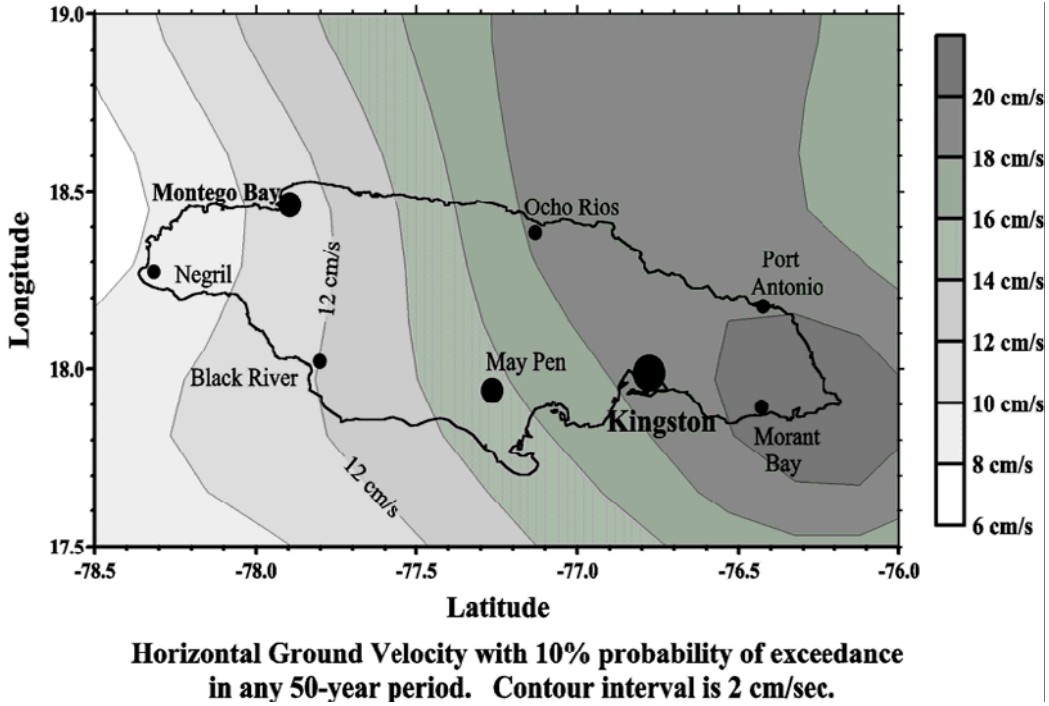
Figure 3-5 shows the epicenters of over one-hundred (100) earthquakes which have occurred in or near Jamaica between 1998 and 2001. With over 100 such occurrences, there was no significant damage to any approved infrastructure within the island to warrant consideration for the adjustment or revision of any building or construction codes for the island.



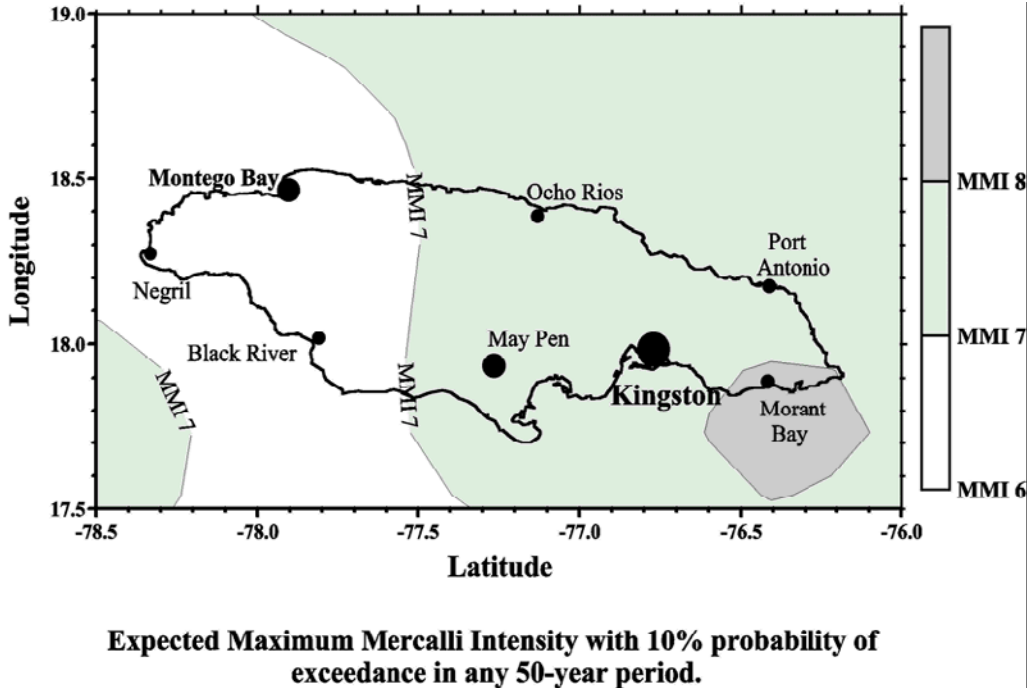
**FIGURE 3-5: EPICENTERS OF EARTHQUAKES OCCURRING BETWEEN 1998 AND 2001 IN THE VICINITY OF JAMAICA<sup>7</sup>**

Figures 3-6 and 3-7 below outline the Horizontal Ground Acceleration with 10% probability of exceedance in any 50-year period, and the expected maximum Mercalli Intensity with 10% probability of exceedance in any 50-year period. Point, Hanover is situated in the area of Jamaica with the lowest possibility of exceedance in any 50-year period for Horizontal Ground Acceleration or expected maximum Mercalli Intensity of 6.

<sup>7</sup> Source: *Earthquake Unit, University of the West Indies, Mona*



**FIGURE 3-6: HORIZONTAL GROUND ACCELERATION IN JAMAICA<sup>8</sup>**



**FIGURE 3-7: MAXIMUM MERCALLI INTENSITY IN JAMAICA<sup>9</sup>**

<sup>8</sup> OAS Sub-regional Seismic Hazard Maps, <http://www.oas.org/CDMP/document/seismap/>, Accessed August 17, 2005.

### **3.1.8.3 FLOODING VULNERABILITY AND STORM WATER MANAGEMENT**

Assessing whether an area is prone to flooding or not, not only requires a hydrostratigraphic assessment of the area, but also the collection of physical data such as rainfall run-off patterns, topography and information obtained from actual flooding events (especially as perceived by individuals who reside or frequent the area during such events) over a statistically appreciable period. Such information is not readily available from relevant statutory agencies in a compiled and organized format and is beyond the scope of this Environmental Impact Assessment. However, conclusions may be drawn from available data, including informal reports of flooding, or the absence thereof.

It is estimated that the project site is located in areas where the soil can be permeable to semi-permeable. Permeability or semi-permeability of the areas implies that water should percolate through the ground and drain into the underlying aquifers or aquicludes. Hence, in the absence of extreme weather conditions, namely heavy consistent and prolonged rainfall, the mentioned areas should not flood readily. Further, the site is not located in sink holes or areas of deep depression, therefore, issues related to runoffs from surrounding areas should not add to the flooding vulnerability of the area, especially if adequate drainage is employed. There has been no specifically reported flooding for the Point area.

Storm water management is of concern, primarily to the residents of the community. The designs of the proposed development have taken storm water management into consideration. The designs incorporate drainage patterns and channelling incorporated with French drains (gravel soak-away) to reduce the potential for flooding and to keep rainwater from flowing across the property and into the sea. The storm water management system is designed for a 10-year return rainfall event. This method of storm water management has the potential to impact groundwater in the area, however, this impact will be similar to that which occurs under natural circumstances where rainfall percolates into the subsurface and makes its way to groundwater.

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<sup>9</sup> OAS **Sub-regional Seismic Hazard Maps**, <http://www.oas.org/CDMP/document/seismap/>, Accessed August 17, 2005.

The proposed development is responsible for storm water generated on their property and it will be the National Works Agency's (NWA) responsibility to control and contain storm water that is generated on the highways.

### **3.1.9 SOLID WASTE MANAGEMENT**

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Solid waste generated during the pre-construction, construction and occupational phases of the project will be properly managed to maintain the aesthetic and cleanliness of the site.

#### **3.1.9.1.1 PRE-CONSTRUCTION**

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Pre-construction activities will generate waste primarily associated with the removal of vegetation from the site. This waste will be stockpiled on site and removed through a contract waste removal company for proper disposal.

#### **3.1.9.1.2 CONSTRUCTION PHASE**

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A wide variety of waste materials will be generated during the construction phase of the project. This will include packaging materials, containers, general construction refuse and rubble among other items. During construction, roll-off type waste containers will be situated throughout the project area for collection of solid waste generated. These roll-off containers will be exchanged as they become full and will be removed from the site by a contracted waste disposal company for disposal at landfill. Care will be taken to insure that waste materials are managed and maintained in such a way that they do not get scattered by wind and impact on the property or the surrounding communities.

#### **3.1.9.1.3 OCCUPATIONAL PHASE**

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During the occupational phase of the project, a variety of solid waste streams will be generated. Where practicable, the facility will undertake recycling and reuse of materials to minimize the volume of waste that must be disposed. Additionally, the facility will be equipped with solid waste dumpsters provided by the contracted solid waste removal company. These will be located at several locations around the facility to make waste management and disposal convenient. Issues relevant to the control of pests, vermin and any other potential waste related problem will be addressed as needed.

## 3.2 BIOLOGICAL ENVIRONMENT

### 3.2.1 TERRESTRIAL VEGETATION

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The terrestrial floral and faunal assessment of Point Estate was carried out over a 3 day period. Initial assessment was done on July 20, 2005, and followed up July 27-28, 2005. The project site was assessed by focussing on two parcel of land separated by the Highway. The two areas identified were:

1. A lowland coastal zone - The main hotel area, projected to house the two-phase 800-room hotel project along with beaches, restaurants etc.
2. An elevated coastal zone - This elevated zone, separated from the coast by the Highway, is projected to be a top-rated golf course.

The terrestrial floras of both sites were assessed by way of literature reviews, on-site walk-throughs and the point centred quarter method. Each plant species encountered along the walk through was identified and recorded and where *in-situ* species identification was not possible, specimens were collected, and tagged for later identification.

### 3.2.2 THE LOWLAND COASTAL ZONE

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The lowland coastal zone was typical of vegetation found along Jamaica's north coast. The dominant tree species in this zone is *Coccoloba uvifera* (Sea Grape) from the beach and cliffs inwards 10-12m and *Acacia tortuosa* (Wild Poponox) inwards from 15m to the Highway. Species such as *Sesuvium portucalastrum* (Seaside purslane), *Ipomea pes-caprae* (Beach Morning Glory), and *Batis maritime* (Salt Wort), pioneer species, were found near the beaches.

Mangrove trees were found in small patches in areas with water influences (both saline and non-saline, primarily *Laguncularia racemosa* (White Mangrove) with an occasional *Avicennia germinans* (Black mangrove). No pneumatophores of the Black Mangrove were found. Other terrestrial species encountered in the lowland coastal zone were *Ficus elastica* (Rubber Tree), *Melicoccus bijugatus* (Guinep), *Morinda citrifolia* (Noni), *Samanea saman* (Guango), *Terminalia catappa* (West Indian Almond) and *Thespesia populnea* (Seaside Mahoe) to name a few.



The shrub layer was represented primarily by grasses with few herbaceous species. The species present on the site are typical coastal species, which are adapted to hot, salty conditions.

The lowland zone can be classified as having three vegetation community types.

1. A beach community and associated rock outcropping of ancient coral reefs. This community type was evidenced by significant stands of Sea Grape interspersed with Seaside Mahoe, and patches of White and Black Mangroves which are all xerophytic in nature. This area was approximately 10 – 12m in width. This area experiences constant salt spray from crashing waves in areas where cliffs or ancient reef outcroppings exists, and strong coastal winds. Trees at sea level were approximately 2m in height and bent due to the windy nature of the environment. Protected beaches and high cliffs had slightly taller trees (Plates 3-3 and 3-4).



**PLATE 3-3: PATCH OF WHITE MANGROVES NEAR EASTERN BEACH**



**PLATE 3-4: PATCH OF COCCOLOBA UVIFERA (SEA GRAPE) NEAR A BEACH AREA**

2. An Acacia plant community (Plates 3-5 and 3-6). This plant community was primarily *Acacia* sp. The trees ranged in height from a grove of 0.5-1m just behind the beach community to 3-4m tall closer to the highway. The density of this area was 4 trees / m<sup>2</sup>. No significant herb layer was established below these trees aside from grass species. Herbaceous species found were mainly confined to the edges of this community. This area is a re-growth of the old coastal forest that bordered the old coastal highway. Plants in his community were mainly xerophytic in nature, acclimatising the dry harsh environment. *Tillandsia* sp. (Old Man's Beard) was occasionally observed in trees.

Ground vegetation was very sparse except in cases where grasses were observed. This area was the least disturbed with an average tree density of 2500 trees per hectare. Leaf litter was low throughout this area.



**PLATE 3-5: PICTURE SHOWING SECTION OF ACACIA SP. GROVE**



**PLATE 3-6: PICTURE SHOWING SECTION OF ACACIA SP. GROVE AND REMNANTS OF THE OLD COAST HIGHWAY**

3. A ravine/drainage canal community type. This plant community was comprised of several tree species and herbs. Primarily fruit bearing trees were found in this area. This is indicative of seeds that were possible discarded by passengers along the old coast highway that found good soil and water conditions along the banks of drainage ditches and canals. These trees were on average 3-4m in height. Trees such as *Blighia sapida* (Ackee), *Terminalia catappa* (West Indian Almond), *Morinda citrifolia* (Noni), *Melicoccus bijugatus* (Guinep), and *Samanea saman* (Guango) were found in this area. This area tends to be narrow, with plants not distributed more than 5m from the banks of the drainage ditches or canals. Leaf litter was highest in this area of the lowland coastal zone.



**PLATE 3-7: MELICOCCLUS BIJUGATUS (GUINEP) AND BAMBOO PLANTS ALONG THE BANKS OF A DRAINAGE DITCH NEAR A BEACH**

The lowland coastal zone had a mineral soil layer that was very thin and stony throughout most areas.

Forty-nine (49) species were the identified of which none were endemic, rare, threatened or endangered (Table 3-3). Additionally, none of the plants have significant cultural or economic value. Plants such as Poor Man's Orchid are attractive, and a

recommendation has been made to the developers to incorporate as many of these trees into the landscape design. Others recommended are large shade trees such as Guango. Additionally, the vegetation of the site has the potential to support fauna.

**TABLE 3-3: OBSERVED VEGETATION ON PROPOSED SITE FOR HOTEL CONSTRUCTION (LOWLAND COASTAL ZONE)**

<b>Species</b>	<b>Common Name</b>	<b>Status</b>
<i>Acacia tortuosa</i>	Wild poponax	Common
<i>Achyranthes sp.</i>		Common
<i>Allamanda cathartica</i>	Yellow Allamanda	Common
<i>Antigonon leptopus</i>		Common
<i>Avicennia germinans</i>	Black mangrove	Common
<i>Axonopus compressus</i>	Carpet grass	Common
<i>Bambusa vulgaris</i>	Bamboo	Common
<i>Batis maritime</i>	Salt Wort	Common
<i>Bauhinia purpurea</i>	Poor Man's Orchid	Common
<i>Bidens pilosa</i>	Spanish Needle	Common
<i>Blighia sapida</i>	Ackee	Common
<i>Calotropis Procea</i>	Giant Milkweed	Common
<i>Carica papaya</i>	Papaya	Common
<i>Cenchrus brownie</i>	Burr grass	Common
<i>Centrosema virginianum</i>		Common
<i>Chloris barbata</i>		Common
<i>Coccoloba uvifera</i>	Sea Grape	Common
<i>Cocos nucifera</i>	Coconut	Common
<i>Commelina diffusa</i>	Water grass	Common
<i>Commelina erecta</i>		Common
<i>Comocladia pinnatifolia</i>		Common
<i>Crescentia cujete</i>	Calabash	Common
<i>Cyperus odoratus</i>		Common
<i>Dalbergia ecastaphyllum</i>		Common
<i>Euphorbia prostrata</i>		Common
<i>Ficus elastica</i>	Rubber Tree	Common
<i>Ipomoea pes-caprae</i>	Beach morning glory	Common
<i>Laguncularia racemosa</i>	White mangrove	Common
<i>Leucaena leucocephala</i>	Lead tree	Common
<i>Mangifera indica</i>	Mango	Common
<i>Melicoccus bijugatus</i>	Guinep	Common
<i>Mimosa pudica</i>	Shame Weed	Common
<i>Moghania strobilifera</i>	wild hops	Common
<i>Morinda citrifolia</i>	Noni	Common
<i>Panicum maximum</i>	Guinea grass	Common
<i>Passiflora maliformis</i>	Sweetcup	Common
<i>Pimenta dioica</i>	Pimento	Common
<i>Samanea saman</i>	Guango	Common
<i>Sesuvium portulacastrum</i>	Seaside Purslane	Common
<i>Sida acuta</i>	Broomweed	Common

Species	Common Name	Status
<i>Tecoma stans</i>		Common
<i>Terminalia catappa</i>	West Indian Almond	Common
<i>Thalia senegalensis</i>	Water Canna	Common
<i>Thespesia populnea</i>	Seaside Mahoe	Common
<i>Tillandsia recurvata</i>	Old man's beard	Common

### 3.2.3 THE ELEVATED COASTAL ZONE

The elevated coastal zone is on land at least 10-15m above sea level. The typical vegetation of this zone was grasses and small trees on the lower slopes and large trees on the upper slope. The dominant tree species were *Samanea saman* (Guango), *Pimenta dioica* (Pimento) and *Acacia tortuosa* (Wild Poponox).



**PLATE 3-8: PICTURE OF RELIEF OF THE AREA SHOWING THE HIGHWAY SEPARATING THE LOWLAND COASTAL ZONE AND THE ELEVATED COASTAL ZONE (WESTERN-MOST BORDER)**

This zone showed signs of pastoral activity, with goats roaming the grassland and evidence of man-made watering holes and pens. Along the southern border other farming activities observed were the growing of cash crops, banana and pimento. Possibly due to the soil type, clay-limestone mix, various trees were able to take root with a closed canopy along the southern ridge. This area also showed evidence of past hurricane damage, possibly from Hurricane Ivan in 2004 and Hurricanes Dennis and Emily since the beginning of this year. Several trees were partially blown over, resting

on other sturdy trees in the vicinity. As a result, few patches of partial canopy cover were observed. The lower slopes featuring mainly *Acacia* sp. also showed evidence of blow-downs.

Several drainage areas were found in this zone, mainly arising from the slope. Large trees such as Guango, Pimento, *Spathodea campanulata* (Flame of Forest) were found along these drainage features and further inland at the top and southern section of this zone. The lower slopes had *Acacia* trees approximately 3m in height with grasses covering the ground. Canopies of these trees were not as closed as those of the lowland coastal zone, and trees were thicker and taller on average.

The canopy height along the southern was on average 4-5m. Taller trees were found along the drainage features, some in excess of 8m such as *Ceiba pentandra* (Silk Cotton tree), and Guango. The shrub layer was more extensive than that of the lowland coastal zone or the lower slopes. Species present were *Amaranthus spinosus* (Prickly calalu), *Sida acuta* (Broomweed), *Allamanda cathartica* (Yellow Allamanda), and *Antigonon leptopus* all of which are adapted to dry limestone coastal conditions.



**PLATE 3-9: ELEVATED ZONE SHOWING TALL TREES ALONG THE DRAINAGE FEATURE AND OPEN GRASSLAND USED FOR PASTURE**



**PLATE 3-10: PART OF THE RELIEF OF THE ELEVATED ZONE ALONG THE HIGHWAY (EAST)**

Forty-eight (48) species were identified in the elevated coastal zone, of which none were endemic, rare, threatened or endangered (Table 3-4 below). Additionally, none of the plants have significant cultural or economic value. Plants such as the Silk Cotton and Guango trees are known bird nesting trees, as well as being tall shade trees, and a recommendation has been made to the developers to incorporate as many of these trees into the landscape design.

**TABLE 3-4: OBSERVED VEGETATION ON PROPOSED SITE FOR GOLF COURSE/HOTEL CONSTRUCTION (ELEVATED COASTAL ZONE)**

<b>Species</b>	<b>Common Name</b>	<b>Status</b>
<i>Agave sp.</i>		Common
<i>Acacia farnesiana</i>		Common
<i>Acacia tortuosa</i>	Wild poponax	Common
<i>Achyranthes sp.</i>		Common
<i>Annona muricata</i>	Soursop	Common
<i>Annona squamosa</i>	Sweetsop	Common
<i>Antigonon leptopus</i>		Common
<i>Arthrostylidium sarmentosum</i>	Dwarf bamboo	Common
<i>Azadiracta indica</i>	Neem	Common
<i>Bambusa vulgaris</i>	Bamboo	Common
<i>Bidens pilosa</i>	Spanish needle	Common
<i>Blighia sapida</i>	Ackee	Common



Species	Common Name	Status
<i>Bursera simaruba</i>	Red Birch	Common
<i>Capparis flexuosa</i>	Limber Caper	Common
<i>Cecropia peltata</i>	Trumpet tree	Common
<i>Ceiba pentandra</i>	Cotton tree	Common
<i>Chloris barbata</i>		Common
<i>Comocladia pinnatifolia</i>		Common
<i>Cocos nucifera</i>	Coconut	Common
<i>Cordia sebestena</i>		Common
<i>Delonix regia</i>	Flamboyant Tree	Common
<i>Ficus elastica</i>	Rubber tree	Common
<i>Guazuma ulmifolia</i>	bastard cedar	Common
<i>Helicteres jamaicensis</i>	screw tree	Common
<i>Hylocereus triangularis</i>		Common
<i>Leucaena leucocephala</i>	Lead tree	Common
<i>Mangifera indica</i>	Mango	Common
<i>Melicoccus bijugatus</i>	Guinep	Common
<i>Moghania strobilifera</i>	wild hops	Common
<i>Mucuna pruriens</i>	Cowitch	Common
<i>Panicum maximum</i>	Guinea grass	Common
<i>Philodendron sp.</i>		Common
<i>Pimenta dioica</i>	Pimento	Common
<i>Rhynchospora nervosa</i>	Star grass	Common
<i>Ricinus communis</i>	Castor oil	Common
<i>Samanea saman</i>	Guango	Common
<i>Sansevieria trifasciata</i>	Tiger cat	Common
<i>Solanum torvum</i>	Susumber	Common
<i>Sparisoma rubripinne</i>	Sweetsop	Common
<i>Spathodea campanulata</i>	Flame of Forest	Common
<i>Sporobolus sp.</i>		Common
<i>Stachytarpheta jamaicensis</i>	vervine	Common
<i>Tamarindus indica</i>	Tamarind	Common
<i>Terminalia catappa</i>	West Indian Almond	Common
<i>Turnera ulmifolia</i>	Ram-Goat Dashalong	Common
<i>Urechites lutea</i>	Night shade	Common
<i>Wedelia trilobata</i>	Marigold	Common

### 3.2.4 FAUNAL SURVEY

The avifauna was sampled on July 27-28, 2005. On the 27<sup>th</sup> sampling occurred during the hours of 12pm and 3pm. Sampling on the 28<sup>th</sup> was conducted during the hours of 5:30am and 7:00am.

The method used was the point count method. Birds were identified *in-situ* via calls and visually with the use of a field guide. Point counts taken within the lowland coastal zone were done at several spots along the old coast road which runs parallel the coast and midway the zone. Within the elevated coastal zone, point counts were taken along the southern ridge and within the *Acacia* stand.

Fourteen (14) bird species were observed in total, of which the Jamaican Crow, Jamaican Blackbird and Sad Flycatcher are endemic. Birds were observed feeding and nesting. This is possibly due to the fruit trees which are found within the property. The area is used by birds specializing in different ecological niches. Table 3-5 provides a list of the avifauna observed at the proposed development site.

Several species of butterflies were observed particularly in the grasslands of the lowland coastal zone. *Danaus plexippus* (The Monarch), *Heliconius charitonius simulator* (Zebra Butterflies), and *Euptoieta hegesia hegesia* (The Tropical Fritillary) were observed.



**PLATE 3-11: LYCOREA CLEOBAEA (TIGER BUTTERFLY)**



**PLATE 3-12: HELICONIUS CHARITONIUS (ZEBRA BUTTERFLY)**

Other faunal types observed throughout the site were various ant species such as Duck Ants with nests, Termites, Spiders, Rats, Lizards (*Anolis grahami* and *A. lineatopus*) and Mosquitos. In addition, burrows belonging to the species *Cardisoma guanhumii* (Great land crabs) and *Ocypode* sp. (Ghost crab) were observed on the site (Table 3-6).

**TABLE 3-5: OBSERVED AVIFAUNA ON PROPOSED SITE FOR FIESTA PALLADIUM HOTEL**

Species	Common Name	Status
<i>Bubulcus ibis</i>	Cattle Egret	Common Resident
<i>Coereba flaveola</i>	Bananaquit	Common Resident
<i>Columbina passerina</i>	Common Ground Dove	Common Resident
<i>Columba leucocephala</i>	Balpate	Common Resident
<i>Corvus jamaicensis</i> **	Jamaican Crow	Common Endemic
<i>Egretta caerulea</i>	Little Blue Heron	Common Resident
<i>Leptotila jamaicensis</i>	Caribbean Dove	Common Resident
<i>Loxigilla violacea</i>	Greater Antillean Bullfinch	Common Resident
<i>Mniotilta varia</i>	Black-and-white Warbler	Common Resident
<i>Myiarchus barbirostris</i> **	Sad Flycatcher	Common Endemic
<i>Nesopsar nigerrimus</i>	Jamaican Blackbird	Endemic
<i>Streptoprocne zonaris</i>	White-collared Swift	Common Resident
<i>Tyrannus caudifasciatus</i>	Loggerhead Kingbird	Common Resident
<i>Zenaida aurita</i>	Zenaida Dove, Pea Dove	Common Resident

\*\* Endemic

**TABLE 3-6: OTHER OBSERVED FAUNA (BUTTERFLIES, INSECTS ETC.) ON PROPOSED SITE FOR HOTEL & GOLF COURSE CONSTRUCTION**

Species	Common Name	Status
<i>Butterflies</i>		
<i>Ascia monuste eubotia</i>	Greater Antillean Whites	
<i>Danaus plexippus</i>	The Monarch	
<i>Dione (Agraulis) vanillae insularis</i>	The Tropical Silverspot	
<i>Dryas iulia delila</i>	Julia	
<i>Euptoieta hegesia hegesia</i>	The Tropical Fritillary	
<i>Heliconius charitonius simulator</i>	Zebra Butterflies	
<i>Lycorea cleobaea</i>	Tiger Butterfly	
<i>Phoebis sp.</i>	Sulphur	
<i>Other Fauna</i>		
<i>Anolis garmani</i>	Green lizard	
<i>Anolis lineatopus.</i>	Brown lizard	
	Green grasshopper	
	Brown grasshopper	
<i>Austrolestes sp.</i>	Dragonfly	
<i>Crematogaster sp.</i>	Duck Ants	
<i>Eleutherodactylus sp.</i>	Frogs	
<i>Cardisoma guanhumii</i>	Great Land Crab	
<i>Gecarcinus lateralis</i>	Black Land Crab	
<i>Ocypode sp.</i>	Ghost crab	

### 3.2.5 MARINE ENVIRONMENT

A marine assessment was conducted of the marine environment at Point, Hanover at four (4) locations in the vicinity of the proposed development, tow transects running south-north and two transects running east-west (Figure 3-8). The marine assessment utilized dives of the area, video, and still photography to document the condition of the structures and marine life in the study area. The list of marine flora and fauna follows the end of this section. The sites assessed are:



Overall, at least 18 different species of fish, 7 different species of stony coral, and an assortment of other marine flora and fauna were observed. The coral reefs offshore were moderately healthy and supported an abundant and diverse benthic community of hard and soft corals, sea fans and rods, anemones and echinoderms. However, the reefs showed signs of stress in the form of damaged and diseased corals, and algal growth throughout. On a positive note, the population of sea urchins and other reef cleaners was good indicating a reef that may be classified as recovering. Bare coralline sand patches, dead coral and coralline rubble and algae accounted for about the 50 % of the benthic substrate, with the rest being living coral reef structure.

Significant seagrass beds interspersed, approximately 70-75% ground cover, with patches of sand characterised the three beach areas of the site. Two types of seagrasses were encountered; manatee grass (*Syringodium filiforme*) and turtle grass (*Thalassia testudinum*). Turtle grass accounted for approximately 70-80% of seagrass cover and appeared to have longer and thicker blades with increasing depth, as well as significant algal growth on the blades. Evidence of grazing was also observed on the seagrass blades. Among the marine fauna observed in this area were the sea urchins, *Diadema antillarum* (Black Sea Urchin) and *Trypneustes ventricosus* (White Sea Urchin), as well as numerous Mantis shrimp mounds and an occasional sea cucumber. Calcareous algae such as *Halimeda* sp. were also present in these areas.



**PLATE 3-13: TURTLE GRASS**

Few coral heads were observed scattered in the shallow coralline substrate between the back reef and the sea grass beds, and in close proximity to the rocky outcropping along the shore.

The main fringing reef system is located directly across from the reef offshore Fort Charlotte, which is on the western side of the Lucea Harbour. This reef is known as the point reef. Due to its proximity to the site it could easily be negatively affected by poor wastewater and above-ground run-off from the site or the neighbouring environs.

This reef system comprised a fairly young coral structure represented by several healthy coral heads. Hard coral species represented included, the dominant species *Diplora strigosa* (Symmetrical Brain Coral), and *Siderastrea sidarea* (Massive Starlet Coral) as well as *Porites* sp. (Finger corals) and *Millepora complanata* (Fire coral). Coral species expected on the reef crest were not observed in significant numbers. The Elkhorn coral (*Acropora palmate*) and Staghorn corals (*Acropora cervicornis*) observed were mostly in a dead or decaying stage and predominantly covered by algae.

Soft corals were represented by sea fans, sea rods (*Plexaurella* sp.), and sea plumes (*Pseudopterogorgia* sp.). Sea rods, silt-pore sea fans and sea plumes were dominant throughout.



**PLATE 3-14: MASSIVE STAR CORAL (*SIDERASTREA SIDAREA*)**



**PLATE 3-15: BRAIN CORAL (*DIPLORA STRIGOSA*)**



**PLATE 3-16: SEA RODS AND ASSORTED REEFSCAPE**





**PLATE 3-17: SEA FAN**



**PLATE 3-18: SEA RODS (*PLEXAURELLA SP.*) AND SEA PLUMES (*PSEUDOPTEROGORGIA SP.*)**



**PLATE 3-19: SEA ANEMONE**

Various algal species were observed such as, *Gracilaria* (Red Algae), *Caulerpa* sp. (Green algae) and *Dictyota linearis* (Brown algae). Algal cover on the reef was approximately 30-40%. Macrophytic algae were observed interspersed in and around coral heads and on living and dead coral colonies and coralline rubble.



**PLATE 3-20: MACROPHYTIC ALGAE COVERING DEAD ELKHORN CORAL AND GROUND SUBSTRATE**

Marine fauna was limited to the numerous fishes, few echinoderms and rays observed during the study. No sea turtles or lobsters were observed. However, the grazing noted on the seagrass may potentially indicate turtle activity in the recent past. Several reef fish species were observed in this area, including, Juvenile wrasses, parrot fishes and damselfishes. Several yellow stingrays (*Urolophus jamaicensis*) were observed as well as sea cucumbers and sea worms. Microfauna were represented at the site by mantis shrimp mounds, snails and crabs.

Nerites (small snails) were found in large numbers along the rocky shores. The Nerites feed on the available algae. They scrape small bits of plant off the rocks with their rough tongue. Chitons were also fairly well represented.



**PLATE 3-21: SEA CUCUMBER**



**PLATE 3-22: BLACK SEA CUCUMBER**



**PLATE 3-23: SEA WORM**



**PLATE 3-24: REEF CLEANER SHRIMP**



**PLATE 3-25: BLACK SEA URCHIN (DIADEMA ANTILLARUM) CLOSE TO STAR CORAL AND SEA ROD**



**PLATE 3-26: BLACK (DIADEMA ANTILLARUM) AND WHITE (TRYPNEUSTES VENTRICOSUS) SEA URCHINS**



**PLATE 3-27: YELLOW STINGRAYS (*UROLOPHUS JAMAICENSIS*)**

No turtles, turtle tracks or turtle nests were observed on the first visit along the shoreline of the sandy beaches. However, on the second visit, evidence of turtle tracks and nest were observed. Two of these nests were observed to be invaded the following day, circumstances unknown. Therefore, the possibility, though remote, exists that at least one of the beaches is a nesting site. Turtle nesting is more commonly known along the beaches in the Negril area. It should be noted however, that beaches along the north coast with extensive sea grass beds, fairly good reef diversity, little or no light intrusion and minimal noise are ideal areas for marine turtles to nest. A recommendation has been made to the developers to include in their plans systems to protect the beaches as possible turtle nesting grounds.

Tables Table 3-7 and 3-8 below outline the marine flora and fauna identified at Point, Hanover.

**TABLE 3-7: OBSERVED MARINE FLORA AT POINT, HANOVER**

Species	Common Name
<i>Algae</i>	
<i>Amphiroa sp.</i>	Red algae
<i>Gracilaria</i>	Red Algae
<i>Caulerpa sp.</i>	Green alage
<i>Halimeda sp.</i>	Green algae
<i>Penicillus sp.</i>	Green algae
<i>Dictyota linearis</i>	Brown algae
<i>Udotea sp.</i>	Carpet algae
<i>Sea Grasses</i>	
<i>Syringodium filiforme</i>	Manatee Grass
<i>Thalassia testudinum</i>	Turtle Grass

**TABLE 3-8: OBSERVED MARINE FAUNA AT POINT, HANOVER**

Species	Common Name
<i>Fishes</i>	
<i>Abudefduf saxatilis</i>	Sergeant Major
<i>Acanthurus chirurgus</i>	Doctor fish
<i>Chaetodon sp.</i>	Banded Butterflyfish
<i>Eupomacentrus sp.</i>	Dusky Damselfish
<i>Holocentrus adscensionis</i>	Squirrel fish
<i>Gramma loreto</i>	Royal Basslet
<i>Thalassoma bifasciatum</i>	Bluehead Wrasse
<i>Ocyurus chrysurus</i>	Yellow tail Snapper
<i>Pomacanthus paru</i>	Angel fish
<i>Holacanthus sp.</i>	Angel fish
<i>Stegastes fuscus</i>	Dusky Damselfish
<i>Stegastes variabilis</i>	Beaugregory
<i>Chromis verater</i>	Threespot Chromis
<i>Centropomus sp.</i>	Snook
<i>Sparisoma sp.</i>	Striped Parrot fish
<i>Lutjanus sp.</i>	Snapper
<i>Diodon holocanthus</i>	Puffer
<i>Bothus lunatus</i>	Peacock Flounder
<i>Invertebrates</i>	
<i>Diadema antillarum.</i>	Black Sea Urchin
<i>Trypneustes ventricosus</i>	White Sea Urchin
<i>Lytechinus variegatus</i>	Green sea urchin



Species	Common Name
	Mantis shrimp
<i>Nerita versicolor.</i>	Nerite
<i>Littorina sp.</i>	
<i>Holothuria atra</i>	Black Sea cucumber
<i>Acanthopleaura granulata</i>	Chiton
<i>Potamilla reniformis</i>	Sea worm, Feather duster
<b>Corals &amp; Sponges</b>	
<i>Diplora strigosa</i>	Symmetrical Brain Coral
<i>Montastrea annularis</i>	Boulder star coral
<i>Plexaurella sp.</i>	Slit-pore Sea Rods
<i>Porites astroides</i>	Mustard hill coral
<i>Porites portes</i>	Finger coral
<i>Siderastrea sidarea</i>	Massive Starlet Coral
<i>Plakortis sp.</i>	Mustard sponge
<i>Millepora sp.</i>	Fire coral
<i>Acropora palmata</i>	Elkhorn coral
<i>Muricea muricata</i>	Sea whip
<b>Vertebrates</b>	
	Marine Turtles
<i>Urolophus jamaicensis</i>	Rays

### 3.3 HISTORICAL ENVIRONMENT

The Point area is not known to be a major National Heritage location. However, the property contains several historical artefacts. There is a pier of cut stone similar to those used in other Forts across Jamaica by the British, including Fort Charlotte just across the Harbour. There are tombs on both sides of the property dating back to the 17<sup>th</sup> century. It is very possible that British Navy soldiers of that period are among those entombed on the property.

The possibility also exists for Taino settlements to be found on the property though none are presently known for the site. This was evidenced by the most recent assessment, the North Coast Highway Project, which made cuts to realign the Highway through the property.

### **3.3.1 HERITAGE SITES IN CLOSE PROXIMITY**

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There are two famous heritage sites, one in close proximity to the Point area of Hanover. They are:

- Fort Charlotte, and
- Tryall Estate and Great House

Fort Charlotte, located across the Harbour, was built around 1746. It was erected for the defense of the harbour and stands on the peninsula overlooking the channel. It was named in honour of King George III's Queen, Charlotte, and is probably one of the best kept forts in the island.

There are still three guns in reasonably good condition located on the compound and access to the fort has been made easier for visitors.

The Tryall Estate & Great House is on the main road between Hopewell and Sandy Bay to the east of Point. Once a sugar estate, Tryall Golf & Country Club is maintained as a national heritage site. The property is known to exhibit nineteenth century grave stone fragments, the ruins of a sugar works including a huge cast-iron water wheel which still functions, an old cast-iron boiler and a beautiful brick structure chimney.

# **SOCIAL ENVIRONMENT**

## 4 SOCIAL ENVIRONMENT

### 4.1 SURVEY POPULATION

The surveyed areas were chosen based on the Enumeration Districts as outlined by the Statistical Institute of Jamaica, which were in closest proximity to the site at Point, Hanover.

The survey population was devised based on a 5% sample of the Total Housing Units (THU) in the area. Each respondent was from a different household, such that, each respondent would represent one Housing Unit.

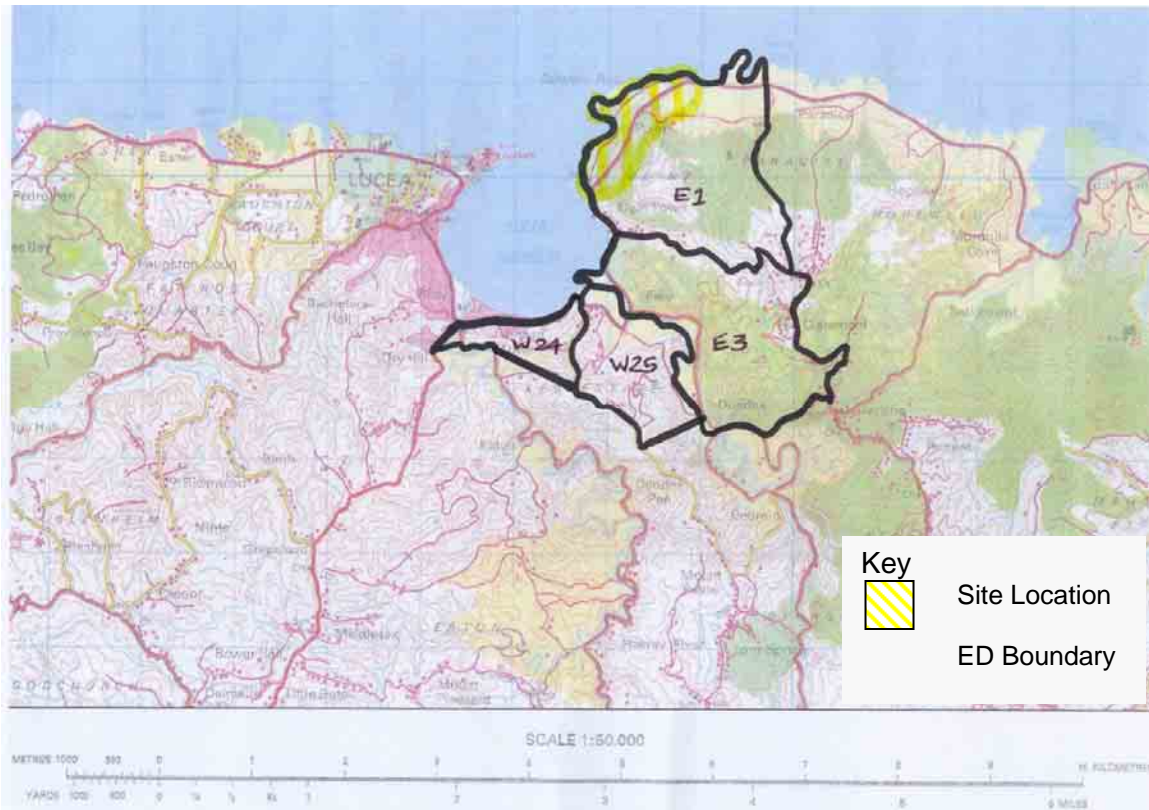
The Enumeration Districts surveyed, along with their corresponding THU values are found in the table below.

**TABLE 4-1: ENUMERATION DISTRICTS SURVEYED**

ENUMERATION DISTRICT CODE	THU	5% SAMPLE VALUE	SURVEYS ISSUED
W24	179	9	10
W25	171	9	10
E1	110	6	6
E2	124	6	8
E3	185	9	6
TOTAL	769	39	40

Please see the map following, showing the location of the Enumeration Districts in which socio-economic surveys were issued concerning the development.

Also, please refer to the Appendix 1 for a copy of the Survey Instrument.



**FIGURE 4-1: MAP SHOWING THE LOCATION OF EDS SURVEYED**

## 4.2 SURVEY ANALYSIS

### 4.2.1 PERSONAL CHARACTERISTICS

**TABLE 4-2: TABLE SHOWING RESPONSES TO QUESTIONS ABOUT THE RESPONDENTS' PERSONAL CHARACTERISTICS**

ED ▶	W24	W25	E1	E2	E3	TOTAL
Parameter ▼						
<b>GENDER</b>						
Male	5	5	3	5	5	23
Female	5	5	3	3	1	17
<b>AGE RANGE</b>						
Under 20	0	0	0	0	0	0
20-39	6	4	3	4	3	20
40-49	1	4	1	1	1	8

50-59	3	2	2	1	1	9
60 and over	0	0	0	2	1	3
Not stated	0	0	0	0	0	0
<b>YEARS OF RESIDENCE</b>						
0-5	1	0	0	2	0	3
6-10	0	0	0	0	1	1
11-20	3	5	1	4	0	13
More than 20	6	5	5	2	4	22
Not stated	0	0	0	0	1	1

#### **4.2.2 PERSONAL CHARACTERISTICS**

Twenty-three (23) of the forty (40) respondents were male. No one surveyed was younger than 20 years old, and all but five persons stated that they had been living in their respective communities for more than 10 years.

#### **4.2.3 AWARENESS**

All but two (2) of the respondents were aware of the plans for development. Only one person expressed aversion to the development, on the basis that he would not receive employment from it. When asked if they knew when the development was to begin, only two said yes. Six persons thought that the hotel operation would affect the availability of electricity or water to them.

#### **4.2.4 SITE USE**

27 persons stated that they use the site for various activities, including swimming, sailing and fishing. Six persons identified the area as being of cultural interest. Some interesting features described were the beach, and the gravesite.

#### **4.2.5 EMPLOYMENT**

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Twenty-nine (29) of the forty (40) respondents indicated that they were in paid employment at the time. Their occupations included self employed mechanics and vendors, labourers, construction workers, and civil servants. When asked about the employment status of people in their households, it was revealed that sixty-six (66) people in the households of the respondents were in paid employment at the time. This compared to the 84 people stated to be unemployed.

Unemployment was a major issue for the residents. This was reflected in their responses in Sections 2, 3 & 4 of the Survey Instrument. (Please refer to Appendix II) When asked about their dislikes of the community, (Question 9), thirty-four (34) persons gave unemployment as one of their dislikes. Thirty-seven (37) persons stated that large scale development would be beneficial to the community. When asked how, they all indicated the anticipated impact on job opportunities. Twenty-three (23) were also anticipating skills development, which would enhance employability.

In section 4, 38 respondents were anticipating the new hotel. Twenty-four (24) of those thirty-eight (38) specifically anticipated job availability.

# **POLICY, LEGISLATION, STANDARDS AND REGULATORY FRAMEWORK**



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## **5 POLICY, LEGISLATION, STANDARDS AND REGULATORY FRAMEWORK**

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The policies, legislation, regulations and environmental standards of the Government of Jamaica (GOJ), which pertain to this development have been researched and analyzed, to ensure that the project complies with all policy, legal and regulatory requirements. The areas examined included environmental quality, health and safety, protection of sensitive areas, protection of endangered species, site selection and land use control at the regional, national and local levels, which relate to or should be considered within the framework of the project.

### ***5.1 AGENDA 21***

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In June 1992, Jamaica participated in the United Nations Conference for Environment and Development (UNCED). One of the main outputs of the conference was a plan of global action, titled Agenda 21, which is a “comprehensive blueprint for the global actions to affect the transition to sustainable development” (Maurice Strong). To which, Jamaica is a signatory. Twenty seven (27) environmental principles were outlined in the Agenda 21 document. Those relevant to this project, which Jamaica is obligated to follow are outlined below:

Principle 1 – Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

Principle 3 – The right to development must be fulfilled to equitably meet developmental and environmental needs of present and future generations.

Principle 10 – Environmental issues are best handled with the participation of all concerned citizens, at the relevant level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in the decision making process.

Principle 11 – States shall enact effective environmental legislation, environmental standards, management objectives and priorities should reflect the environmental and developmental context to which they apply.

Principle 15 – In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

## **5.2 DEVELOPMENT GUIDELINES**

All development applications are submitted for approval to the Town Country Planning Authority, through the local Parish Council and then forwarded to the relevant authorities including NEPA and the Environmental Control Division (ECD) of the Ministry of Health. NEPA, the governing environmental agency, may require an environmental impact assessment (EIA) to be considered along with the development plan for the Authority's approval. The ECD imposes guidelines for air, water and soil standards to be maintained after construction.

## **5.3 RELEVANT LEGISLATION**

Legislation relevant to the establishment of a hotel development in St. Ann is outlined below.

### **5.3.1 THE NATURAL RESOURCES CONSERVATION AUTHORITY (NRCA) ACT, 1991**

The NRCA Act (1991) is the overriding legislation governing environmental management in Jamaica. It requires that all new projects, (or expansion of existing projects), which fall within prescribed categories be subject to an environmental impact assessment (EIA).

The regulations require that eight (8) copies of the EIA Report be submitted to the Authority for review. There is a preliminary review period of ten (10) days to determine whether additional information is needed. After the initial review the process can take up to ninety (90) days for approval. If on review and evaluation of the EIA the required criteria are met, a permit is granted. In the event that the EIA is not approved, there is provision for an appeal to be made to the Minister.

Specifically, the relevant section(s) under the Act which address the proposed project are:

**Section 10:** Empowers the Authority to request EIAs for the construction of any enterprise of a prescribed category.

**Section 12:** Addresses the potential for contamination of ground water by trade effluent and sewage.

**Section 15:** Addresses the implementation of stop orders and fines associated with the pollution of water resources.

**Section 16:** Authorizes the government to intervene in order to prevent the contamination of ground water.

**Section 17:** Addresses the authority of the government to request in writing, any information pertaining to the:

1. performance of the facility
2. quantity and condition of the effluent discharged
3. the area affected by the discharge of effluent

In keeping with the requirements of this Act, the following submittals have been in support of this project:

- Permit Application (pursuant to Section 9)
- Project Information Form (PIF) pursuant to Section 10 (1)(a)
- Completed EIA document (8 copies to NEPA and one electronic copy)

### **5.3.2 WILDLIFE PROTECTION ACT, 1945**

This act involves the declaration of game sanctuaries and reserves, game wardens, control of fishing in rivers, protection of specified rare or endemic species. The Act also provides for the protection of animals and makes it an offence to harm or kill a species which is protected. It stipulates that, having in one's possession "whole or any part of a protected animal living or dead is illegal.

This Act has to be considered for the proposed project, ecological assessments will determine if rare or endangered species will be impacted.

### **5.3.3 THE BEACH CONTROL ACT (1956)**

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The Beach Control Act provides for the regulation of activities within twenty-five (25) metres of the shoreline. It includes control of the construction of sheds and huts on beaches, and prohibits the use of public beaches for fishing activities. The Act is administered by NEPA, and also makes provisions for the creation of Marine Protected Areas. The sections of the Act relevant to the project are:

#### **Section 7:**

1. Notwithstanding anything to the contrary in this Act, the Minister may, upon the recommendation of the Authority, make an order declaring:
  - a) any part of the foreshore and the floor of the sea defined in the Order together with the water lying on such part of the floor of the sea to be a protected area for the purpose of this Act; and
  - b) such activities as may be specified in the Order to be prohibited activities in the area defined in the Order, being any or all of the following activities:
    - i) fishing by any means specified in the Order;
    - ii) the use of boats other than boats propelled by wind or oars where such boats are used for purposes other than for the doing of anything which may be lawfully done under the Harbours Act, the Marine Board Act, the Wrecks and Salvage Law, the Pilotage Act or the Exclusive Economic Zone Act;
    - iii) the disposal of rubbish or any other waste material;
    - iv) water-skiing;
    - v) the dredging or disturbance in any way of the floor of the sea

#### **Section 9:**

1. Subject to the provision of Section 8 (this does not apply to docks wharves pier etc. constructed prior to June 1, 1956), no person shall erect, construct or maintain any dock, wharf, pier or jetty on the foreshore or the floor of the sea, or any structure, apparatus or equipment pertaining to any dock, wharf, pier or jetty and encroaching on the foreshore or the floor of the sea, except under the Authority of a license granted by the Minister on behalf of the Crown.

### **5.3.4 THE PUBLIC HEALTH ACT (1974)**

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This Act falls under the ambit of the Ministry of Health (MOH) and governs all matters concerning the handling of food material. In addition, provisions are also made under this Act for the activities of the Environmental Control Division (ECD), a division of the MOH. The ECD has no direct legislative jurisdiction, but works through the Public Health Act to monitor and control pollution from point sources. Action against any breaches of this Act would be administered by the Central Health Committee. The functions of the department include:

- The monitoring of waste water quality, including regular water quality analysis, using water standards published by NEPA;
- Monitoring of occupational health as it relates to industrial hygiene of potentially hazardous working environments;
- Monitoring of air pollutants through its laboratory facilities.

### **5.3.5 JAMAICA NATIONAL HERITAGE TRUST ACT (1985)**

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The Jamaica National Heritage Trust, formerly the Jamaica National trust, administers the Act. This Act provides for the protection of important areas, including the numerous monuments, forts, statues, and buildings of historic and architectural importance in Jamaica.

This Act will prove applicable if any structures of archaeological and/or architectural importance are located on the site, affected by the site activities or unearthed during site activities. Since this project is in an area that may contain items of archaeological importance, an Archaeological Retrieval Plan is included as part of this document.

### **5.3.6 TOWN & COUNTRY PLANNING ACT (1987)**

This Act governs the development and land use (excluding agriculture) in specified areas, through Development Orders, local planning authorities, development planning processes and Tree Preservation Orders. Under this Act the Town Planning Department is the agency responsible for the review of any plans involving development. The Act allows for specific conditions to be stipulated and imposed on any approved plans. The planning decision is based upon several factors, including;

- Location of the development;
- Land use and zoning;
- Effect of the proposal on amenities, traffic, etc.

# **IMPACT IDENTIFICATION**

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## 6 IMPACT IDENTIFICATION

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This development has the potential to create a variety of impacts as it is implemented. These potential impacts can be either positive or negative depending on the receptors involved and other parameters such as magnitude and duration. It is anticipated that this project will have significant positive impacts on areas such as the economy, employment, foreign exchange earnings among others. Since this report is geared primarily towards identification of environmental impacts those will be presented in greater detail later in this report, other impacts will be presented in less detail as indicated below:

### 6.1.1 SOCIO-ECONOMIC IMPACTS

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**Employment** – Direct employment of approximately 1200 tradesmen and labourers during pre-construction and construction phases. Direct employment of approximately 1000 employees is anticipated during the operational phase. The development will also spawn indirect employment throughout the surrounding communities and within the tourism industry as a whole. This represents a significant positive, both direct and indirect, long-term impact.

**Foreign Exchange Earnings/Benefit to Economy** – The proposed development represents an upward investment of at least US\$60,000,000 and a long-term source of foreign exchange in keeping with success of the resort. The Island should see increased revenues from Income and General Consumption Taxes resulting from the development. This is a significant positive, both direct and indirect, long-term impact on the economy of the communities and the country.

**Community Benefits** – Other than providing direct and indirect employment and revenue sources, the development will result in an improvement of infrastructure and resources in the area (water and electricity) along with improved property values. These are significant positive, direct, long-term impacts to the community.



## **6.1.2 ENVIRONMENTAL IMPACTS**

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The following tables provide a clear indication of potential environmental impacts associated with this development, and provide information on potential receptors, duration, magnitude, and mitigation measures. Since these are potential impacts, there is no certainty that they will materialize, however, the developers will be prepared to deal with any adverse impacts should they arise during all phases of development.

**6.1.2.1 PRE-CONSTRUCTION, CONSTRUCTION & OPERATION PHASES**

**TABLE 6-1: POTENTIAL IMPACTS & PROPOSED MITIGATION STEPS**

Potential Impact	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<b>Removal of Vegetation, Loss of Habitat</b>	Pre-Construction [Site Clearance]	Land, Flora, Fauna, Endemic Species	Medium & Immediate/Long-term	Direct/Minor Negative / Reversible impact	Included in cost of construction
<p><b>Mitigation Measures:</b></p> <p>The removal of vegetation and ecological habitats is unavoidable and is the main trade-off to be made against the economic benefits to be derived from project implementation. By design many mature trees will be left intact, and by extension, any endemic terrestrial fauna. Species re-introduction should occur naturally in these areas.</p>					
Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<b>Aesthetics</b>	Construction [Zinc Fencing around Project Area]	Humans (Nearby Residential Communities)	Minor & Approx. 18 months	Minor Negative/Indirect /Sporadic/ Unavoidable Impact	Minimal cost if existing fence is maintained

<p><b>Mitigation Measures:</b> Maintenance and Upkeep. Construction Monitoring. Communication with Residents/Resorts. Speedy Removal.</p>					
Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<p><b>Noise, Fugitive Dust, Air Pollution</b></p>	<p>Pre-Construction &amp; Construction [Vehicular Traffic (Trucks/Heavy Equipment), Soil Stockpiles, Construction Activities]</p>	<p>Humans (Residential and Resort Communities)</p>	<p>Medium &amp; Occasional (Approx. 18 months)</p>	<p>Minor Negative/indirect/Sporadic/Avoidable Impact</p>	<p>External monitoring</p>
<p><b>Mitigation Measures:</b> Appropriate scheduling of activities. Construction Monitoring. Dust Suppression through sprinkling. Proper Servicing of Equipment. Quick Response. Communication With Residents/Resorts. Covered vehicles on public roads Flag men will be utilized to manage traffic flow in and out of the site</p>					
Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<p><b>Storm water, Erosion, Sedimentation, Silting, Run-Off to Sea</b></p>	<p>Pre-Construction &amp; Construction [Site Clearance, Vegetation Removal, Excavation]</p>	<p>Marine/Coastal Zone</p>	<p>Medium &amp; Occasional/Long -Term (through occupational phase)</p>	<p>Minor Negative/Indirect /Sporadic/Avoidable Impact</p>	<p>Should not exceed JA\$1.0 Million</p>

<p><b>Mitigation Measures:</b></p> <p>Careful Phasing of Activities With Consideration of Rainy Seasons. Construction Monitoring. Implementation of Control Devices (Drainage, Silt Fencing, Soak-away, etc.)</p>					
Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<p><b>Flooding Potential, Drainage Patterns, Storm Surge, High Water Table.</b></p>	<p>Construction &amp; Operation [Incidental Rainfall, Hurricane, Excavation, Soak Away]</p>	<p>Groundwater, Coastal Waters, Project Area</p>	<p>Medium &amp; Occasion/Long-term</p>	<p>Minor Negative/Indirect /Sporadic/ Avoidable Impact</p>	<p>Included in construction cost</p>
<p><b>Mitigation Measures:</b></p> <p>Site designed to withstand 10-year return rainfall event. Construction Monitoring. Maintain design elevations. Maintain site drainage mechanisms. Not a typical problem in the area.</p>					
Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<p><b>Sewage and Wastewater (Effluent/Odour)</b></p>	<p>Construction &amp; Operation [Sewage Treatment System, Temporary Sewage Handling during Construction]</p>	<p>Coastal Waters, Groundwater, Human</p>	<p>Minor &amp; Long-term</p>	<p>Minor Negative, indirect, avoidable impact</p>	<p>Septic Hauler during construction period (included contract)</p>

<p><b>Mitigation Measures:</b></p> <p>Operate and Maintain facility in keeping with designs. Quick Response to issues. Implement contingency plans as needed (Septic Hauler, etc.). System has no direct discharge to the environment. Treated effluent goes to irrigation. Utilize licensed temporary sewage system provider for Portable Toilets and associated disposal.</p>					
Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<b>Socio-Economic/Cultural/Loss of Traditional Use and Access to Beach</b>	Pre-Construction, Construction & Operation [Entire Development]	Human	Large & Long-term	Minor Negative/direct impact	Not Quantifiable
<p><b>Mitigation Measures:</b></p> <p>Positive socio-economic impacts. Provide public access if possible or prudent to beaches. Identify optional public resources in proximity for bathing, fishing, etc. Recognize Prescriptive Rights of population to utilize beach. Secure any identified cultural heritage resources through JNHT.</p>					
Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<b>Solid Waste Handling and Disposal</b>	Pre-Construction, Construction & Operation [Vegetation Removal/Construction Activities/Packaging]	Coastal Waters, Land, Groundwater, Humans, Aesthetic	Minor & Occasional/Long-term	Minor negative, direct, avoidable impact	Included in cost of construction

<p><b>Mitigation Measures:</b></p> <p>Minimize and reduce quantities of solid waste generated during site preparation and construction. A waste management plan should be prepared and followed. If practical, branches and leaves can be put through a wood chipper to make soil cover for garden beds, etc. Solid Waste not utilized on site should be disposed of in an approved landfill by approved haulers. An approved waste removal service should be contracted to remove waste produced on site.</p>					
Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
<p><b>Noise, leaks, exhaust from construction implements (batching plants, heavy equipment), petrol/oil/lubricant storage</b></p>	<p>Pre &amp; Post Construction, Operation</p>	<p>Soils, Groundwater, Coastal Waters, Air, Humans</p>	<p>Medium &amp; Long-term</p>	<p>Minor negative, direct, sporadic, avoidable impact</p>	<p>Equipment Maintenance included in contractors scope</p>
<p><b>Mitigation Measures:</b></p> <p>Equipment and chemical storage will be monitored and maintained on a regular basis. Any indication of leaks, discharge to the ground will be addressed immediately. Equipment maintenance on site will be minimal and monitored. Construction monitoring will include these potential impacts.</p> <p>Chemicals and fuels with a potential to leak, will be stored in secured, impermeable areas to reduce the likelihood of contamination (e.g. the diesel fuel tank proposed for the facility, will be housed in a reinforced concrete vault and properly sealed).</p>					

**TABLE 6-2: POTENTIAL IMPACTS & PROPOSED MITIGATION STEPS CONT.**

Activity	Action	Environment al Receptor	Magnitude & Duration	Significance	Economic Value
<b>Beach Aesthetics</b>	Construction [Vegetation Removal/Construction Activities/Coastline Modification]	Soils, Groundwater, Coastal Waters and Marine Flora & Fauna therein,	Medium & Short-term	Minor negative, direct, sporadic, avoidable impact	Included in cost of construction
<p><b>Mitigation Measures:</b></p> <p>Requires excavation of sea grass and coarse material (gravel etc.) and the introduction of higher quality sand (finely graded, possibly from offshore). Silt screens will be used to contain sedimentation during beach filling exercises. Sea grasses removed may be transplanted at a suitable location along the coast.</p> <p>Equipment and chemical storage will be monitored and maintained on a regular basis. Any indication of leaks, discharge to coastal waters will be addressed immediately. Equipment maintenance on site will be minimal and monitored. Construction monitoring will include these potential impacts.</p>					
Activity	Action	Environment al Receptor	Magnitude & Duration	Significance	Economic Value
<b>The increase in traffic (buses, cars, staff vehicles etc.) noise levels, gaseous emissions</b>	Construction & Operation of Facility	Human	Minor & Occasional over Long-Term	Minor negative, direct, occasional, avoidable impact	No major cost associated

<p><b>Mitigation Measures:</b>                  The increase in traffic, while a notable impact, is not anticipated to be significant due to planned improvements to the local roadways (Highway 2000) and the overall development of the area as a tourist resort area. If the facility owns vehicles, they will insure that they are properly maintained at all times. Offending contract vehicles will be prohibited from the property.</p>					
Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
Utilities Shortfall (Potable Water Supply and Electricity Shortfall)	Operation of Facility	Human (Community and General Area)	Medium & Unsure	Minor negative, direct, avoidable impact	NWC & JPS Co responsibility
<p><b>Mitigation Measures:</b>                  Work with NWC and JPS Co to develop independent/reliable source of each utility for the resort. Initiate water and energy conservation and minimization. Utilize treated wastewater for irrigation.</p>					
Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
Solid Waste Management	Operation of Facility	Land, Soils, Air, Human, Coastal Waters	Minor & Occasional	Minor indirect, occasional, avoidable impact	Included in waste haulers contract
<p><b>Mitigation Measures:</b>                  It is in the best interest of the facility to maintain high quality waste management and disposal practices. Garbage skips/dumpsters will be strategically placed throughout the site and emptied as needed by a contract solid waste company for disposal at an approved landfill.</p>					



**TABLE 6-3: IMPACT IDENTIFICATION MATRIX**

	EIA Activities																	
	Site Preparation			Construction									Operation					
	Site Surveying	Site Clearance	Site Access	Solid Waste Disposal	Materials Sourcing	Materials Transport	Construction Camp/Materials Storage	Construction Works	Solid Waste Disposal	Sewage Treatment	Surfacing/Paving	Landscaping	Traffic	Solid Waste Disposal	Water Supply	Electricity Generation	Increased Migration	Watersports and Beach Usage
TOPOGRAPHY																		
GEOLOGY																		
AMBIENT NOISE & VIBRATION																		
WINDS																		
RAINFALL																		
NOISE AND DUST																		
DRAINAGE																		
TEMPERATURE																		
NATURAL HAZARD VULNERABILITY																		
<b>Ecological Parameters:-</b>																		
TERRESTRIAL ECOSYSTEMS																		
VEGETATION																		
BIRDS																		
OTHER FAUNA																		
AQUATIC ECOSYSTEMS																		
VEGETATION																		
FAUNA																		
SENSITIVE HABITATS																		
<b>Socio-Economic Parameters:-</b>																		
AESTHETICS																		
LAND USE COMPATIBILITY																		
EMPLOYMENT																		
FOREIGN EXCHANGE EARNINGS																		
STRUCTURES/ROADS																		
WASTE MANAGEMENT																		
TRAFFIC ON THE ACCESS ROAD																		

KEY	
NO IMPACT	
MAJOR POSITIVE IMPACT	
MINOR POSITIVE IMPACT	
MAJOR NEGATIVE IMPACT	
MINOR NEGATIVE IMPACT	

	EIA Activities																	
	Site Preparation				Construction								Operation					
	Site Surveying	Site Clearance	Site Access	Solid Waste Disposal	Materials Sourcing	Materials Transport	Construction Camp/Materials Storage	Construction Works	Solid Waste Disposal	Sewage Treatment	Surfacing/Paving	Landscaping	Traffic	Solid Waste Disposal	Water Supply	Electricity Generation	Increased Migration	Watersports and Beach Usage
INCREASED CRIME																		
TOURIST HARASSMENT																		
HAZARD VULNERABILITY																		
SOLID WASTE DISPOSAL																		
SEWAGE DISPOSAL																		
OCCUPATIONAL HEALTH & SAFETY																		

KEY	
NO IMPACT	
MAJOR POSITIVE IMPACT	
MINOR POSITIVE IMPACT	
MAJOR NEGATIVE IMPACT	
MINOR NEGATIVE IMPACT	

# **IMPACT MITIGATION MATRIX**

## 7 IMPACT MITIGATION


The following are mitigative actions proposed for the project. Provided below is a key explaining the type, magnitude of each impact identified.

**TABLE 7-1: IMPACT MITIGATION MATRIX (PRE-CONSTRUCTION PHASE)**

	Proposed Mitigative Measures													
	Detailed Topographic Surveys	Effective Site Management	Scheduling of Construction Activities	Waste Management Plan	Regular Solid waste collection	Placing of Solid waste Receptacles	Road Paving and Surfacing	Dust Management Techniques	Proper Vehicle Maintenance	Installation of Sediment Traps	Security & Fencing	Positive Impact No Mitigation	Community Relations	Flora & Fauna Relocation
<b>Impacts - Preconstruction Phase</b>														
Clearing of Site Vegetation		Minor Negative	Minor Negative	Minor Negative	Minor Negative	Minor Negative			Minor Negative					Minor Negative
Leveling of Site	Minor Negative	Minor Negative	Minor Negative				Minor Negative		Minor Negative					
Transportation of Construction Material		Minor Negative	Minor Negative	Minor Negative			Minor Negative	Minor Negative						
Increase in Noise		Minor Negative	Minor Negative					Minor Negative					Minor Negative	
Increase in Dust		Minor Negative	Minor Negative				Minor Negative						Minor Negative	
Disturbance of flora and fauna		Minor Negative	Minor Negative											Minor Negative
Aesthetics		Minor Negative	Minor Negative	Minor Negative		Minor Negative	Minor Negative		Minor Negative	Minor Negative		Minor Negative	Minor Negative	
Increased Traffic		Minor Negative	Minor Negative											
Increased Employment												Major Positive	Minor Positive	
Road Wear		Minor Negative	Minor Negative				Minor Negative		Minor Negative				Minor Negative	
Increased Sedimentation of Coastal Waters		Minor Negative							Minor Negative					
Change in the Natural Drainage Patterns	Minor Negative	Minor Negative												
Solid Waste Generation		Minor Negative		Minor Negative	Minor Negative	Minor Negative								
Disturbance of Marine Communities		Minor Negative							Minor Negative					
Increased Earning Potential for Community												Major Positive	Minor Positive	
Trepassers into Conservation Area										Minor Negative		Minor Negative	Minor Negative	
Traffic Inconveniences		Minor Negative	Minor Negative				Minor Negative							

KEY	
NO IMPACT	
MAJOR POSITIVE IMPACT	Major Positive
MINOR POSITIVE IMPACT	Minor Positive
MAJOR NEGATIVE IMPACT	Major Negative
MINOR NEGATIVE IMPACT	Minor Negative

**TABLE 7-2: IMPACT MITIGATION MATRIX (CONSTRUCTION PHASE)**

	Proposed Mitigative Measures															
	Detailed Topographic Surveys	Phasing of Building Plans	Scheduling of Construction Activities	Waste Management Plan	Regular Solid waste collection	Placing of Solid waste Receptacles	Road Paving and Surfacing	Dust Management Techniques	Proper Vehicle Maintenance	Landscaping Measures	Effective Site Management	Security & Fencing	Installation of Sediment Traps	Scheduling of Heavy Vehicles	Positive Impact No Mitigation	Community Relations
<b>Impacts - Construction Phase</b>																
Increased Employment																
Leveling of Site	Minor Positive			Minor Positive	Minor Positive		Minor Positive	Minor Positive		Minor Positive		Minor Positive				
Transportation of Construction Material		Minor Positive	Minor Positive	Minor Positive			Minor Positive	Minor Positive		Minor Positive			Minor Positive			
Increase in Noise		Minor Positive	Minor Positive					Minor Positive		Minor Positive			Minor Positive			
Increase in Dust							Minor Positive	Minor Positive		Minor Positive						
Occupational Health & Safety Concerns			Minor Positive	Minor Positive		Minor Positive	Minor Positive	Minor Positive		Minor Positive						
Aesthetics			Minor Positive	Minor Positive		Minor Positive	Minor Positive		Minor Positive	Minor Positive						
Increased Earning Potential for Community															Major Positive	
Increased Traffic		Minor Positive	Minor Positive					Minor Positive		Minor Positive			Minor Positive			
Road Wear		Minor Positive	Minor Positive				Minor Positive	Minor Positive		Minor Positive			Minor Positive			
Increased Sedimentation of Coastal Waters		Minor Positive	Minor Positive							Minor Positive		Minor Positive				
Change in the Natural Drainage Patterns	Minor Positive									Minor Positive		Minor Positive				
Solid Waste Generation				Minor Positive	Minor Positive	Minor Positive				Minor Positive						
Sewage Disposal				Minor Positive	Minor Positive					Minor Positive						
Trespassers into Conservation Area											Minor Positive					
Accommodations for workers		Minor Positive	Minor Positive	Minor Positive						Minor Positive						Minor Positive
Disturbance of Marine Communities										Minor Positive		Minor Positive				

KEY	
NO IMPACT	
MAJOR POSITIVE IMPACT	Major Positive
MINOR POSITIVE IMPACT	Minor Positive
MAJOR NEGATIVE IMPACT	Major Negative
MINOR NEGATIVE IMPACT	Minor Negative

**TABLE 7-3: IMPACT MITIGATION MATRIX (OPERATIONAL PHASE)**

	Community Wide Plan	Operation & Maintenance Plan	Regulatory Monitoring	Waste Management Plan	Regular Solid waste collection	Placing of Solid waste Receptacles	Security & Fencing	Landscaping Measures	Positive Impact No Mitigation
	<b>Impacts - Occupational Phase</b>								
Increased Employment opportunities									Major Positive Impact
Sewage Treatment System Management		Minor Positive Impact	Minor Positive Impact	Minor Positive Impact					
Drainage Patterns								Minor Positive Impact	
Solid Waste Management	Minor Positive Impact	Minor Positive Impact		Minor Positive Impact	Minor Positive Impact	Minor Positive Impact			
Water Conservation	Minor Positive Impact								
Energy Conservation	Minor Positive Impact								
Aesthetics					Minor Positive Impact		Minor Positive Impact	Minor Positive Impact	
Regulatory Compliance	Minor Positive Impact		Minor Positive Impact	Minor Positive Impact					
Trespassers in Conservation Area							Minor Positive Impact		
Fugitive Dust								Minor Positive Impact	
Increased Earning Potential for Community	Minor Positive Impact								Major Positive Impact

KEY	
NO IMPACT	
MAJOR POSITIVE IMPACT	Major Positive Impact
MINOR POSITIVE IMPACT	Minor Positive Impact
MAJOR NEGATIVE IMPACT	Major Negative Impact
MINOR NEGATIVE IMPACT	Minor Negative Impact

# **ENVIRONMENTAL MONITORING**

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## **8 ENVIRONMENTAL MONITORING**

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The Monitoring Plan to be devised for the development should be implemented during the pre-construction and construction phases of the project. Monitoring involves the observation, review and assessment of onsite activities to ensure adherence to regulatory standards and the recommendations made to reduce negative impacts. The Plan must be comprehensive and address relevant issues, with a reporting component that will be made available to the regulatory agencies based on a mutually agreed frequency. It is recommended that a minimum monthly monitoring report be submitted to NEPA.

The monitoring report will include at a minimum:

- Raw data collected
- Tables/graphs (where appropriate)
- Discussion of results with respect to the development in progress, highlighting parameters which exceed standards
- Recommendations
- Appendices with photos/data, etc.

At a minimum, the following activities will be monitored in the various phases:

### **8.1 PRE-CONSTRUCTION PHASE MONITORING**

- During site clearing activities, those trees that will be saved and incorporated into the facility must be identified and protected. The plants to be retained should be pegged and flagged and if necessary fenced. It is suggested that the developers assess a monetary value (e.g. \$2,500) be placed on each plant, for which the contractor will be made liable. Should the contractor damage or remove a protected tree, the penalty should be assessed. An inventory and map (if applicable) of all trees to be retained must be developed. (Weekly Monitoring)
- Where identified, endemic and rare species should be preserved in place or collected for transplanting (As Observed)
- Stockpiles of soil and vegetative debris generated during site clearing activities should be monitored and maintained to eliminate generation of fugitive dust. (Daily Monitoring)



- Noise levels along the perimeters of the project area should be monitored and recorded to insure that activities at the site are not exceeding standards. (Daily Monitoring)

## **8.2 CONSTRUCTION PHASE MONITORING**

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- Sewage - Ensure that temporary portable chemical toilets are available for construction personnel and that the contents are disposed by an approved waste hauler in an appropriate waste disposal facility. (Weekly Monitoring)
- Sand/Marl/Aggregate Supply - Routinely monitor sourcing of quarry materials to ensure supplier is obtaining supplies from licensed operations. (Monthly Monitoring)
- Solid Waste Management - Ensure that solid waste management plan is prepared, and that workers are aware that no solid waste material should be scattered around the site. Monitor availability and location of skips/dumpsters. (Weekly Monitoring)
- Monitor the disposal of refuse to insure that skips/dumpsters are not overfilled. (Weekly Monitoring)
- Routine collection of solid waste for disposal must be implemented, and disposal monitored to ensure use of approved disposal facilities. (Weekly Monitoring)
- Exposed soil areas must be monitored to determine potential for erosion, silting and sedimentation particularly during storm events. (Weekly Monitoring)
- If erosion, silting or sedimentation is a potential or occurs, immediate steps must be taken to negate the impact on the coastal waters and other receptors where applicable. (As Needed)
- Equipment staging and parking areas must be monitored for releases and potential impacts. (Weekly Monitoring)
- If any cultural heritage resources are unearthed during construction activities, activities should be stopped and the Archaeological Retrieval Plan included in this report implemented. (As Needed)
- Noise levels along the perimeters of the project area should be monitored and recorded to insure that activities at the site are not exceeding standards. (Daily Monitoring)

### **8.3 OPERATION PHASE MONITORING**

- Sewage - Monitor effluent quality periodically to determine compliance with regulatory standards and appropriateness for use as irrigation water. (Monthly Monitoring or as determined by regulatory standards)
- Solid Waste - Monitor solid waste skips/dumpsters and removal contractor to ensure proper waste handling and disposal. (Weekly Monitoring)
- Drainage - Regular inspections of drainage systems should be performed to ensure that the drains remain clear of blockages to safeguard against flooding or erosion of beach. (Monthly Monitoring).

# **APPENDICES**

## **APPENDIX I: REFERENCES**

## **APPENDIX I: REFERENCES**

- Adams, C.D., 1972. *Flowering Plants of Jamaica*. University of the West Indies.
- Downer A. and R. Sutton, 1990. *Birds of Jamaica – A Photographic Field Guide*. Cambridge University Press.

## **APPENDIX II: SURVEY INSTRUMENT**

## APPENDIX II: SURVEY INSTRUMENT

**SURVEY INSTRUMENT**  
**Conrad Douglas & Associates Limited**  
**ENVIRONMENTAL IMPACT ASSESSMENT**  
**For**  
**Fiesta Group Hotel Construction, Point, Hanover**

**Social Impact Assessment**

Community Name \_\_\_\_\_

Community Code \_\_\_\_\_

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**SECTION 1: PERSONAL CHARACTERISTICS**

1) Gender

1. Male
2. Female

2) Age Range

1. Under 20
2. 20 – 39
3. 40 – 49
4. 50 – 59
5. 60 – over
6. Not Stated/No Response

3) How many years have you been living in the community?

1. 0 – 5 Years
2. 6 – 10 Years
3. 11 – 20 Years
4. more than 20 Years
5. Not Stated/No Response

4) How many people live in this household?    M  F  Total

5a. How old are they?

Age Range	#
0-14	
15-19	
20-35	
36-45	
46-55	
56-64	

65 and over	
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5b. How many persons are in paid employment? \_\_\_\_\_

5c. How many persons are unemployed? \_\_\_\_\_

6. Are you in paid employment? Yes  No

7. If Yes, what is your occupation? \_\_\_\_\_

**SECTION 2: OPINIONS ON THE COMMUNITY**

8. What do you like most about the community? **ASK & WAIT FOR RESPONSE**

- 1. Friendly people
- 2. Clean environment:
- 3. Availability of farmland
- 4. Quiet
- 5. No crime & violence
- 6. Other, (specify)\_\_\_\_\_
- 7. Not Stated/No Response

9. What don't you like about the community? **ASK & WAIT FOR RESPONSE**

- 1. Poor roads
- 2. Lack of Utilities
- 3. Crime & violence
- 4. Unemployment
- 5. Dirty environment
- 6. Other, (specify)\_\_\_\_\_
- 7. Not Stated/No Response

10. "Large scale development is beneficial to this community " (e.g. construction activities, hotels, mining operations, housing) Do you agree?

- 1. Yes
- 2. No
- 3. Not Stated/No Response

11. Why do you think so?

- 1. Job opportunities
- 2. It will reduce the peacefulness of the area
- 3. Offers skills development
- 4. Improves utilities
- 5. It will affect environmental quality in a negative way
- 6. Other (specify)
- 7. Not Stated/No Response



**SECTION 3: KNOWLEDGE AND VIEWS ON HOTEL PLANS**  
**Public Awareness**

12. Are you aware of the proposal to set-up a resort hotel on the property at Point beside the Molasses warehouses (on both sides of the road)?

Yes

No

13. If yes, are you:

Strongly in favour

In favour

Neither in favour or against

Against

Strongly against

14. What are your reasons?

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15. Do you know when the proposed development will begin?

Yes

No

16. What effect do you think the proposed hotel construction in or near your area will have on the following:

Economic value of the community

1. Positive
2. Negative
3. No Change
4. Don't Know
5. Not Stated/No Response

Job Opportunities

- 1. Positive
- 2. Negative
- 3. No Change
- 4. Don't Know
- 5. Not Stated/No Response

Pollution

- 1. Positive
- 2. Negative
- 3. No Change
- 4. Don't Know
- 5. Not Stated/No Response

17. Do you think the proposed hotel will affect you personally?

- 1. Yes
- 2. No
- 3. Don't Know/Not Sure
- 4. Not Stated/No Response

18. If Yes, how?

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SECTION 4

19. Have you or any member of your household ever worked in the hotel industry?

- 1. Yes
- 2. No
- 3. Don't Know/Unsure
- 4. Not Stated/No Response

**Social Attitude**

20. Do you look forward to this development?

Yes

No

21. If yes, why?

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22. If no, why not? \_\_\_\_\_

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23. Do you think that the construction and operation of the proposed development will affect the availability of any of your resources (e.g. water, light, aesthetics etc)

Yes

No

24. If Yes, please state which of the resource(s) you suspect will be affected?

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

25. For each affected resource, describe briefly, the nature/extent of the effect

Resource	Nature/ extent of effect

26. Do you use the proposed site for any activity?

Yes

No

27. If Yes, what do use the proposed site for? \_\_\_\_\_

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28. Are there any natural resources on the site that you know of?

Yes

No

29. If Yes, what are these? \_\_\_\_\_

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30. What impacts do you think the proposed hotel resort development will have on this community?

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31. Will the development have any impact on your livelihood?

Yes

No

32. If yes, what are the impacts?

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33. Do you think the proposed development will have any impacts on the environment?

Yes

No

If yes, please explain.

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34. What benefits do you think the proposed development will have on the community?

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35. Do you have any other expectations?

Yes  No

If Yes, what are these?

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36. Is the site of any cultural/historical interest?

Yes  No

If Yes, what/where?

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37. Do you have any involvement in the proposed development?

Yes  No

38. If Yes, how are you involved?

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**HOUSING CONDITIONS**

(Surveyor can ask these questions if he cannot ascertain the answers from observation)

**39. Type Of Dwelling**

- Separate house, detached
- Semi-detached
- Part of a house
- Part of a commercial building

Other

**40. Construction Material**

Block and Steel

Wood

Concrete

Stone/Brick

Wattle and Daub

Other

**AMENITIES**

**41. Toilet Facilities**

Type: \_\_\_\_\_

WC linked to sewer

WC not linked to sewer

Pit

Other

None

**42. Shared**

Yes

No

**43. SOURCE OF WATER**

- Indoor tap/pipe
- Outside Private tap/pipe
- Public stand pipe
- River/Pond/Well
- Rainwater (tank)

**44. KITCHEN (OUTDOOR)**

- Yes
- No

**45. SOURCE OF LIGHTING**

- Electricity
- Kerosene
- Other
- None

**46. TENURE**

- Owner
- Rent-free
- Rented
- Squatter-occupied
- Other

All the completed survey instruments are available for review at your discretion.

Name of Interviewer:  
Date of Interview:

## **Appendix III: PROJECT TEAM MEMBERS**



## **APPENDIX III: PROJECT TEAM MEMBERS**

Team members participating on the project, include:

1. Dr. Conrad Douglas
2. Paul Thompson
3. Orville Grey
4. Geomatrix Ltd.
5. Vance Johnson
6. Deonne Caines
7. Noel Watson
8. Burklyn Rhoden
9. Richard Farrier

**APPENDIX IV: DETAILED DESIGN CRITERIA, PARAMETERS,  
CODES/RULES**

## **APPENDIX IV: DETAILED DESIGN CRITERIA, PARAMETERS, CODES/RULES**

- Actions : NBC of JAMAICA, ANSI/ASCE 7-95  
 Wind : BSCP 3 chapter V part 2, NBC 2nd edition 4.1.2  
 [BSCP 3 Chapter V, Part 2, BRITISH STANDARD CODE OF PRACTICE, LOADING FOR BUILDINGS, CODE OF PRACTICE FOR WIND LOADS]  
 Earthquake: Recommended Lateral Force Requirements and Commentary  
 Seismology Committee Structural Engineers Association of California  
 Concrete : NBC of JAMAICA, ACI 318  
 [ACI-318-05 BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE AND COMMENTARY]  
 Others :  
 INTERNAL FORCES COMPUTE METHOD

Classic

### LOAD FACTORS

(Categories II and III, Table 1-1 CLASSIFICATION OF BUILDINGS AND OTHER STRUCTURES FOR FLOOD, WIND, SNOW, AND EARTHQUAKE LOADS - ASCE 7-02)

A4-1 1.40/1.00 D

A4-2 1.20/1.00 D + 1.60/1.00 L + 0.50/1.00 S

A4-3 1.20/1.00 D + 1.60/1.00 S + (0.50/1.00 L or 0.80/1.00 W)

A4-4 1.20/1.00 D ± 1.30/1.00 W + 0.50/1.00 L + 0.50/1.00 S

A4-5 1.20/1.00 D ± 1.00/1.00 E + 0.50/1.00 L + 0.20/1.00 S

A4-6 0.90/1.00 D ± (1.30/1.00 W or 1.00/1.00 E)

D: Permanent Loads, Condition 0

L : Gravitationals, Conditions 1,2,9,10,11 a 20 y 21

W: Wind, Conditions 3 y 4

E: Earthquake, Conditions 5,6,7,8 y 24

### LOAD SETTINGS

Wind enabled. Direction+- enabled

Earthquake enabled. Direction+- enabled

Automatic Self-weight enabled

### EARTHQUAKE LOAD SETTINGS

Computation method: Dynamic

Ground level (cm) 0

Seismic in vertical direction not considered

Rigid Frames structure (Q = 2.0)

Regular structure

Building Group B2

Compute of vibration modes: Globally with condensation  
 Consider rotational mass  
 No consider accidental eccentricity  
 Combine the horizontal seismic actions by the "30% rule"  
 Rotational seismic acceleration: 0.00 (rd/s<sup>2</sup>) / (cm/s<sup>2</sup>)  
 No. vibration modes to combine: 30  
 % effective mass to combine: 90 %

### COMPUTATION OPTIONS

Undistorted members in horizontal slabs  
 Take into account column dimensions in reticular and solid slabs  
 discretization

### STRUCTURE MATERIALS

Concrete 25 MPa [25 MPa = 250 Kg/cm<sup>2</sup> = 3,625 psi]  
 Corrugated Steel 412 MPa  
 Resistance factors, Fr  
 0.65 (Bending and Compres.)  
 0.80 (Bending and Traction)  
 0.80 (Bending)  
 0.75 (Shear and Tors.Mom.)  
 0.65 (Punching)

### REINFORCEMENT SETTINGS

Cover (mm): Beams = 25, Columns = 25

Yp: Buckling checked (sway mode)  
 Zp: Buckling checked (sway mode)  
 Beams torsion checked  
 Columns torsion checked  
 Beams plastification 15%  
 Minimum positive moment  $qL^2 / 16$   
 It's considered lateral flexion  
 Maximum grave size 20 mm  
 Compute step 30 cm

### DEFLECTION OPTIONS

Verify active deflection:

Spans

Combinated deflection  $L / 240 + 5$  mm

Projections

Relative deflection  $L / 250$

70% Structure self-weight (0 cond.)

20% Partitions

100% Long-lasting live loads

3 months Structure / partitions

60 months Creep deflection

28 days Formwork removal

It's considered shear distortion

Second order effects are not considered

Main bars in beams:

Upper  $\varnothing$  3/4" Resistant

Lower  $\varnothing$  3/4" Resistant

Side  $\varnothing$  1/2"

Suppl. reinforcement in beams:

$\varnothing$  Minimum 5/8"

$\varnothing$  Maximum 3/4"

Maximum number 8

Maximum length 1200 cm

Permit 2 levels

Maximum geometric longitudinal rate  $100 \cdot A_s / A_g = 4.00 \%$

Maximum mechanics longitudinal rate  $(A_s \cdot f_y) / (A_g \cdot f'c) = 0.85$

Main bars in columns:

$\varnothing$  Minimum 1"

$\varnothing$  Maximum 1"

Homogenize in height

Maximum number of supplementary reinforcements by face in rectangular columns: 8

Maximum number of reinforcements in circular columns: 10

Maximum geometric longitudinal rate  $100 \cdot A_s / A_g = 4.00 \%$

Maximum mechanics longitudinal rate  $(A_s \cdot f_y) / (A_g \cdot f'c) = 0.85$

Stirrups reinforcement in beams:

$\varnothing$  Minimum 3/8"

$\varnothing$  Maximum 1/2"

Minimum separation 10 cm. Module 5 cm

% of applied load in the lower face (pending load):

0% in beams with upperly plained slab(s)

100% in beams with lowerly plained slab(s)

50% in the other cases

Stirrups reinforcement in columns:

$\varnothing$  Minimum 3/8"

$\varnothing$  Maximum 1/2"

Minimum separation 10 cm. Module 5 cm

Consider constructive criterions of ACI 318-99

To apply constructive criterions according as next values: