FINAL REPORT

ENVIRONMENTAL IMPACT ASSESSMENT
FOR THE PROPOSED RIU – OCHO RIOS
MAMMEE BAY, ST. ANN

Prepared by
ENVIRONMENTAL SCIENCE AND TECHNOLOGY LIMITED
14 Carvalho Drive
Kingston 10

For:
Port Marly Limited
Norman Manley Boulevard
Negril

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

THE EXECUTIVE SUMMARY

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED RIU – OCHO RIOS RESORT DEVELOPMENT MAMMEE BAY, ST. ANN

EXECUTIVE SUMMARY

1. Port Marly Limited proposes to construct a 846 room hotel on 13.87 hectares (34.26 acres) of land located at Mammee Bay, St. Ann. 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.

2. 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.

3. The study area extended from the Mammee Bay Beach Club to the west, to the Sandals Dunn's River property to the east, and from the Caribbean Sea on the north to the Mammee Beach Road to the south. The proposed development will consist of 846 rooms, with such facilities as disco, shops, bar, pool, sports and recreation areas, support facilities, and a sewage treatment plant.

4. A sewage treatment system designed to treat to the tertiary level using oxidation, filtration and chlorination 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 1,400 m^3 (369,841 gals), which is 15% 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 three 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.

5. The project is expected to consume approximately 1,832,139 litres/day (484,000 gallons/day) of water during maximum occupancy of the development. As a condition of purchase, The NWC has given the developers the assurance that water will be made available for the development. Appendix A includes the correspondence between NWC and JAMPRO on this issue.

6. The hotel is also estimated to use approximately 847,200 kW/month during operation, which will be supplied from the Jamaica Public Service Company (JPS Co.) service lines.

7. 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. 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.

- 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 1200 persons during construction and approximately 800 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 community. 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 socio-economic survey and community meetings).

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 improved communication between the developers and residents of the community. Through community meetings, many issues have been resolved that could have been resolved sooner and easier if communication was better.

- The Proposed Development in Another Location

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

- Land was zoned for the type of development desired
- Size of available land (34 acres) was desirable
- Land was previously permitted for use as a resort hotel development
- 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
- Issues relevant to solid waste management were easily satisfied due to the development of the area and availability of resources

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 Mammee Bay site identified in the Ocho Rios area.

8. All development applications have been submitted for approval to the Town Country Planning Authority, through their local Parish Council and then forwarded to the relevant authorities including the National Environmental Planning Agency (NEPA) and the Environmental Control Division (ECD). 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 of the Ministry of Health imposes guidelines for air, water and soil standards to be maintained after construction.

9. Legislation relevant to the establishment of a hotel development in St. Ann are:

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

10. The parish of St. Ann receives an average of 1,016 mm (40") 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 ^{0}C to 32 ^{0}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 earthquakes events of intensity greater than six have been reported in the area between 1897 and 1978.

11. The shoreline soil is a part of the Falmouth Formation, and consists of a coarse, poorly sorted, calcareous sand with numerous smooth pebbles. However, the dominant lithology is the Hopegate Formation, which tends to be soft and rubbly at depth, so structures built on slopes greater than 1:4 may be at risk. The soft, rubbly nature of the soil also increases the risk of erosion during earth moving activities.

12. 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) 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 plant was Seaside Mahoe (*Thespesia populnea*). Thirty (30) plant species were recorded, none of which are endemic, rare, threatened or endangered.

13. Five (5) bird species were observed on the site, one of which, the Red-billed Streamer tail, is endemic. In addition, at least 20 burrows belong to the species *Cardisoma guanhumi* (Great land crabs) were observed on the site.

14. 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.

15. 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 results obtained from the noise assessment indicated that at present, noise levels in the community are well within the prescribed limits of 70 dB.

16. The project is proposed for an area with a total impact population of 1128 (509M, 619F). The total population of Mammee Bay (1991) was 491 (207M; 284F), with the bulk of the population in the economically active age group (15-64). The area is in a designated resort area, where tourism, agriculture and mining as important elements of the economic base of the region. The parish capital, St. Ann's Bay (population 10,961) is west of the project area, and the town of Ocho Rios, the second largest tourism centre (population 8,189), is east of the project area.

17. 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. There is concern however, with water supply to the development and how it will impact on service to those already in the community. Many have voiced opinions on this matter and would like to see the

NWC upgrade the system significantly so that this and other developments can be welcomed in the area.

18. No major impacts on the environment were identified in the proposed development. The defined project area was previously cleared and only sustained introduced flora, there was however, sightings of the endemic Red Billed Streamer tail bird in the area. 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, some of the endemic terrestrial fauna. Issues related to dust management will be addressed in the monitoring plan for construction and should not be a major issue.

19. 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.

20. The construction of buildings, ancillary facilities, parking areas and tennis courts, 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 channeled into soak-away pits (French drains) to lessen the impact of storm water on the marine environment.

21. 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.

22. This development is supported by the community, the developers have shown that they can develop quality resort hotels in Jamaica within the rules and regulations and 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.

SECTION 1:
INTRODUCTION

1 INTRODUCTION

1.1 PURPOSE

Port Marly Limited proposes to construct a 846 room hotel on 13.86 hectares (34.5 acres) of land located at Mammee Bay, St. Ann, in compliance with the St. Ann Parish Development Order, The Town and Country Planning Act and the NRCA Act of 1991 and other relevant policies, legislation, regulations and standards (Figure 1 – Regional Map). This document embodies a report of the results of the Environmental Impact Assessment (EIA) conducted by Environmental Science and Technology Limited (ESTECH) on the proposed development.

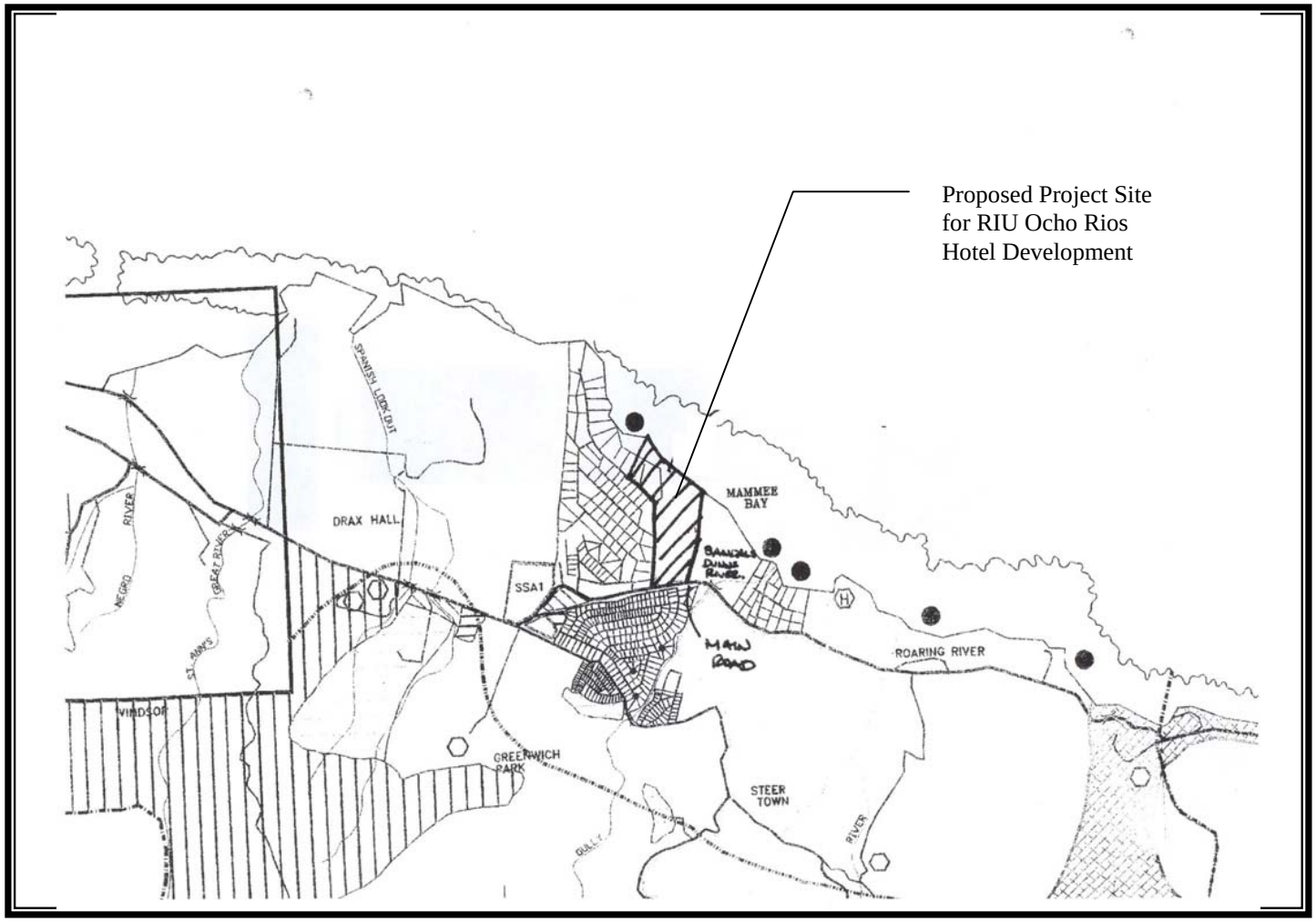
1.2 BACKGROUND

Tourism is one of the major foreign exchange earning sectors in the Jamaican economy. A close relationship exists between tourism-related activities and environmental quality. The natural, socio-economic and cultural environments are important resources for tourism but these features are sensitive to disturbance by human activities. Therefore, negative impacts resulting from inadequately planned and uncontrolled tourism developments can adversely affect the environments on which their success depends. The magnitude of these impacts is largely dependent on the scale, type and operational nature of developments proposed relative to the fragility of the environment.

Tourism development also increases the demand on local infrastructure including transportation, water supply, wastewater collection, sewage treatment, solid waste disposal and health care facilities, among others. Without adequate planning, the service demands may exceed capacity with adverse effects for both tourists and residents.

The 13.86-hectare (34.5 acres) property upon which the development is proposed is situated within the upper-income residential/resort community known as Mammee Bay Estate. The proposed development is located physically between the Sandals Dunn's River Hotel to the east and the Mammee Bay Beach House to the west and Mammee Bay Estates to the southwest.

FIGURE 1 REGIONAL MAP - LOCATION OF PROPOSED DEVELOPMENT, MAMMEE BAY, ST. ANN.



The resort hotel is anticipated to cover a total floor area of approximately 68,756.43 square meters, which will include the appropriate physical structures (rooms, restaurants), amenities, recreational areas (disco, water sport activities), utilities (electricity generation, service areas) and a sewage treatment plant.

The site proposed for this development was permitted for a similar hotel development in 1998, however, that facility was never constructed and the lands were sold to the present developer.

1.3 TERMS OF REFERENCE

An EIA is required to assess the environmental resources present in the area, to identify those activities associated with the proposed project which could have an adverse effect on the environment, and to determine means of avoiding or mitigating the deleterious consequences identified.

The Terms of Reference approved by NEPA for this EIA is as follows:

TASK 1 DESCRIPTION OF THE PROJECT

To be provided is a comprehensive description of the project and its construction methodology noting areas to be reserved for construction, areas to be preserved in their existing state as well as activities and features which will introduce risks or generate impact (negative and positive) on the environment. A comprehensive description of the proposed method of the wastewater treatment and disposal (including the location of infrastructure in relation to the hotel facilities) will also be included along with any structure that will be constructed that may encroach or modify the fore shore of the sea which borders the property where the proposed development is to occur. An estimation of the project life span time lines for the individual tasks in the proposed works is also to be provided. This will involve the use of maps, site plans, aerial photographs and other graphic aids and images, as appropriate, and include information on location, general layout and size, as well as pre-construction, construction, and post construction plans.

TASK 2 DESCRIPTION OF THE ENVIRONMENT

This task involves the generation of baseline data that is used to describe the study area as follows:

i) physical environment

ii) biological environment

iii) Socio-economic and cultural constraints.

It is expected that methodologies employed to obtain baseline and other data be clearly detailed.

Baseline data will include:

(A) **Physical**

i) A detailed description of the existing **geology** and **hydrology**. Special emphasis will be placed on storm water run-off, drainage patterns, effect on groundwater and availability of potable water. Any slope stability issues that could arise will be thoroughly explored.

ii) **Water quality** of any existing wells, rivers, ponds, streams or coastal waters in the vicinity of the development. Quality Indicators will include but not necessarily be limited to nitrates, phosphates, faecal coliform, and suspended solids.

iii) A detailed description of the oceanography of the adjoining marine environment.

iv) A description of the beach with respect to stability, composition, and morphology.

v) Climatic conditions and air quality in the area of influence including wind speed and direction, precipitation, relative humidity and ambient temperatures.

vi) Noise levels of the undeveloped site and the ambient noise in the area of influence.

vii) Obvious sources of pollution existing and extent of contamination.

viii) Availability of solid waste management facilities.

Biological

A presentation of a detailed description of the flora and fauna (terrestrial and aquatic) of the area, with special emphasis on rare, endemic, protected or endangered species will be provided. Migratory species will also be considered. There may be the need to incorporate micro-organisms to obtain an accurate baseline assessment. Generally, species dependence, niche specificity, community structure and diversity ought to be considered.

(B) Socio-economic & cultural

Present and projected population; present and proposed land use; planned development activities, issues relating to squatting and relocation, community structure, employment, distribution of income, goods and services; recreation; public health and safety; cultural peculiarities, aspirations and attitudes will be explored. The historical importance of the area will also be examined along with any cultural or historical resources that may be on the site. While this analysis is being conducted, an assessment of public perception of the proposed development will be conducted. The assessment may vary with community structure and may take multiple forms such as public meetings or questionnaires.

A Natural Hazard Vulnerability assessment may also be conducted

TASK 3 POLICY LEGISLATIVE & REGULATORY FRAMEWORK

An outline of the pertinent regulations and standards governing environmental quality, safety and health, protection of sensitive areas, protection of endangered species, siting and land use control at the national and local levels will be provided. The examination of the legislation shall include at minimum, legislation such as the NRCA Act, the Housing

Act, the Town and Country Planning Act, Beach Control Authority Act, JNHT Act, The Wildlife Protection Act, Building Codes and Standards, Development Orders and Plans and the appropriate international convention/protocol/treaty where applicable.

TASK 4 IDENTIFICATION OF POTENTIAL IMPACTS

Identification of the major environmental and public health issues of concern will be provided and an indication of their relative importance to the design of the subdivision. Identification of the potential impacts will be provided as they relate to, (but are not restricted by) the following:

- Change in drainage pattern
- Flooding potential
- Landscape impacts of excavation and construction
- Loss of natural features, habitats and species by construction and operation
- Pollution of potable, coastal, surface and ground water
- Air pollution
- Capacity and design parameters of proposed sewage treatment facility.
- Socio-economic and cultural impacts
- Risk assessment
- Noise
- Solid waste
- The carrying capacity of the proposed site.
- Removal of vegetation

- Impact on endemic species
- Impact on the Ocho Rios Marine Park Protected Area.
- Impact on potable water supply
- Impact on aesthetics
- Impact of storm surge on the development
- Impact of storm water run-off on the beach
- Impact of sewage effluent arising from the operation of the development
- Impact of construction (such as batching plants, petrol/oil/lubricant storage, sewage)
- Impact to traditional use (bathing and fishing) at the site
- Impact of (high) water table on the construction and operation

A distinction between significant positive and negative impacts, direct and indirect, long term and immediate impacts will be done. Identify avoidable as well as irreversible impacts. Characterize the extent and quality of the available data, explaining significant information deficiencies and any uncertainties associated with the predictions of impacts. A major environmental issue is determined after examining the impact (positive and negative) on the environment and having the negative impact significantly outweigh the positive. It is also determined by the number and magnitude of mitigation strategies which need to be employed to reduce the risk(s) introduced to the environment. Project activities and impacts should be represented in matrix form with separate matrices for pre and post mitigation scenarios.

TASK 5 MITIGATION

Guidelines will be prepared for avoiding, as far as possible, any adverse impacts due to proposed usage of the site and utilizing of existing environmental attributes for optimum development. Quantify and assign financial and economic values to mitigating methods.

TASK 6 MONITORING

A plan will be designed to monitor implementation of mitigatory or compensatory measures and project impacts during construction and occupation/operation of the units/facility. An Environmental Management Plan for the long term operations of the site should be prepared.

An outline monitoring programme will be included in the EIA, and a detailed version submitted to NEPA for approval after the granting of the permit and prior to the commencement of the development. At the minimum the monitoring programme and report will include:

- Introduction outlining the need for a monitoring programme and the relevant specific provisions of the permit license(s) granted.
- The activity being monitored and the parameters chosen to effectively carry out the exercise.
- The methodology to be employed and the frequency of monitoring.
- The sites being monitored. These may in instances, be pre-determined by the local authority and will incorporate a control site where no impact from the development is expected.
- Frequency of report to NEPA.

The Monitoring report will also include a minimum:

- Raw data collected. Tables and graphs are to be used where appropriate.

- Discussion of results with respect to the development in progress, highlighting any parameter(s) that exceeds the expected standards(s).

- Recommendations

- Appendices of data and photographs if necessary.

TASK 7 PROJECT ALTERNATIVES

An examination of the alternatives to the project will be done, inclusive of its layout and design, the site location, the proposed construction methodology and sewage treatment options and also the no-action alternative. This examination of project alternatives will incorporate the use history of the overall area in which the site is located and previous uses of the site itself. As necessary, reference to NEPA guidelines for EIA preparation will be done.

All findings will be presented to the **EIA report** and will reflect the headings in the body of the TOR's, as well as references. Eight hard copies and an electronic copy of the report will be submitted. The report will include an appendix with items such as maps, site plans, the study team, photographs, and other relevant information.

1.4 METHODOLOGY

A study of the existing natural communities found at the proposed site of the development at Mammee Bay was conducted. The study compiled data through assessment, characterizing, mapping and field observation.

1.4.1 ECOLOGICAL ASSESSMENT

Major ecological community types were determined by field assessments, while community classifications were based on the dominant plant types and substrates that composed them. Field investigations also included community structure, primary and secondary human disturbances, fauna and flora identification, water quality analysis and a detailed survey of the reef communities in the project area.

1.4.2 FAUNAL SURVEY

The fauna were surveyed by direct observation and searching for indicators, such as burrows, tracks, scat, tests, skeletons, etc. Species and indicators encountered on the site proposed for development, as well as any observed in the general Mammee Bay area were reported.

Specific sampling of the avifauna was conducted between the hours of 8:00 am and 10:00 am, the period when the species are most active. An accurate description of the physical and vocal characteristics of species that could not be immediately identified was taken; and verification effected by the use of field guides (Bond, 1990; Downer *et al*, 1990).

1.4.3 MARINE ENVIRONMENT

The inshore marine flora and fauna were assessed by snorkeling at 4 sites 100m-400m offshore, within the bay, and at 1 site at the outer reef crest. The species composition and health of the reef communities and associated flora and fauna were assessed. A video and photos of the marine environment were taken to provide a clear depiction of what was observed during the assessment.

1.4.4 WATER QUALITY

A water quality assessment was conducted on coastal waters collected just off the shores of the proposed development. Samples were collected for chemical analysis at mid-depth, and sent to the analytical laboratory section of the Scientific Research Council for analysis. Samples were analysed for the following parameters:

- Biochemical Oxygen Demand (BOD)
- pH
- Nitrate
- Conductivity
- Total Phosphate
- Faecal Coliform
- Total Coliform

1.4.5 NOISE ASSESSMENT

An audiometric survey was conducted on the perimeter of the proposed development site to determine background noise levels along the property boundaries. Readings were taken along the property boundary with Sandals Dunn's River, along the property boundary with Mammee Bay Estates and along the boundary with the Mammee Bay main road.

1.4.6 SOCIO-ECONOMIC SURVEY

A socio-economic impact assessment was obtained from data collected from primary and secondary sources. Secondary material (literature review, census, other official statistics, survey data) was used to determine the basic demographic profile of the study area, land use pattern and urban setting.

Primary data was collected from the communities surrounding the proposed development to obtain a detailed examination of the potential impacts as perceived by members of the communities. This was done through:

- Field observations within the surrounding communities.
- A social survey, based on a written questionnaire. The survey employed both interviewing and sampling to produce quantitative data sets amenable to socio-economic analysis.
- Information collected during two (2) meetings held within the community to address issues relevant to the proposed development.

1.4.6.1 Pilot Study

Once the survey instrument was designed, reviewed and approved, a pilot test was carried out to test and measure the instruments' reliability. The questionnaire was then revised on the basis of the findings of the pilot study, and the sample defined and selected from Enumeration Districts (EDs.) used in the 1991 Population Census, Parish of St. Ann (STATIN, 1994). In addition, fieldwork, planning, supervision, training and debriefing, coding of completed questionnaires, consistency checks and editing of the resulting data set were executed.

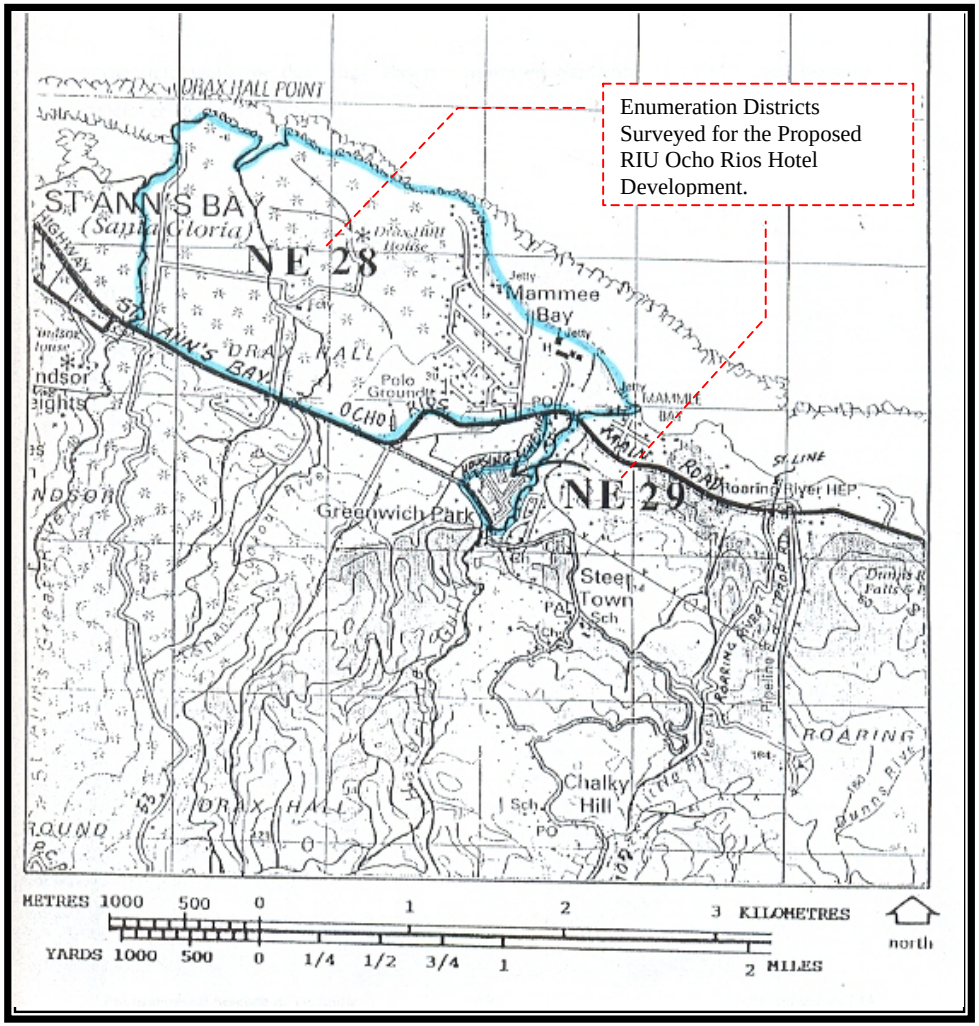
1.4.6.2 Sample Size

The survey used a sample size that would be representative, valid and reliable. The social survey was administered to 26 of the household heads in the study area (10F; 16M). Interviewing was conducted during the month of October 1997 in St. Ann North East EDs 28, 29 (Figure 2).

1.4.6.3 Sphere of Influence

The sociological limit of the sphere of influence of the project was determined by the Enumeration Districts (EDs), which impinge upon the proposed site. Households located within there comprise the basic units of analysis. The impact population of the proposed development is located in St. Ann, NE, EDs 28 and 29. (Figure 2).

FIGURE 2. ENUMERATION DISTRICTS FOR THE SOCIO-ECONOMIC SURVEY OF THE MAMMEE BAY AREA.



The socio-economic survey also included:

- A demographic profile for the parish of St. Ann
- An analysis of the Ocho Rios to Mammee Bay coastal strip, focusing on proposed developments and resort characteristics (urban setting)
- Road and transportation requirements of the region and site
- Land use

SECTION 2: PROJECT DESCRIPTION

2 PROJECT DESCRIPTION

Port Marly Limited is proposing to develop its third resort in Jamaica at a site located in Mammee Bay, St. Ann. The proposed site is situated on 13.87 hectares (34.26 acres) of land located on the north coast of Jamaica between the towns of Ocho Rios and St. Ann's Bay, and directly between the existing Sandals Dunn's River Resort and the residential community of Mammee Bay Estates.

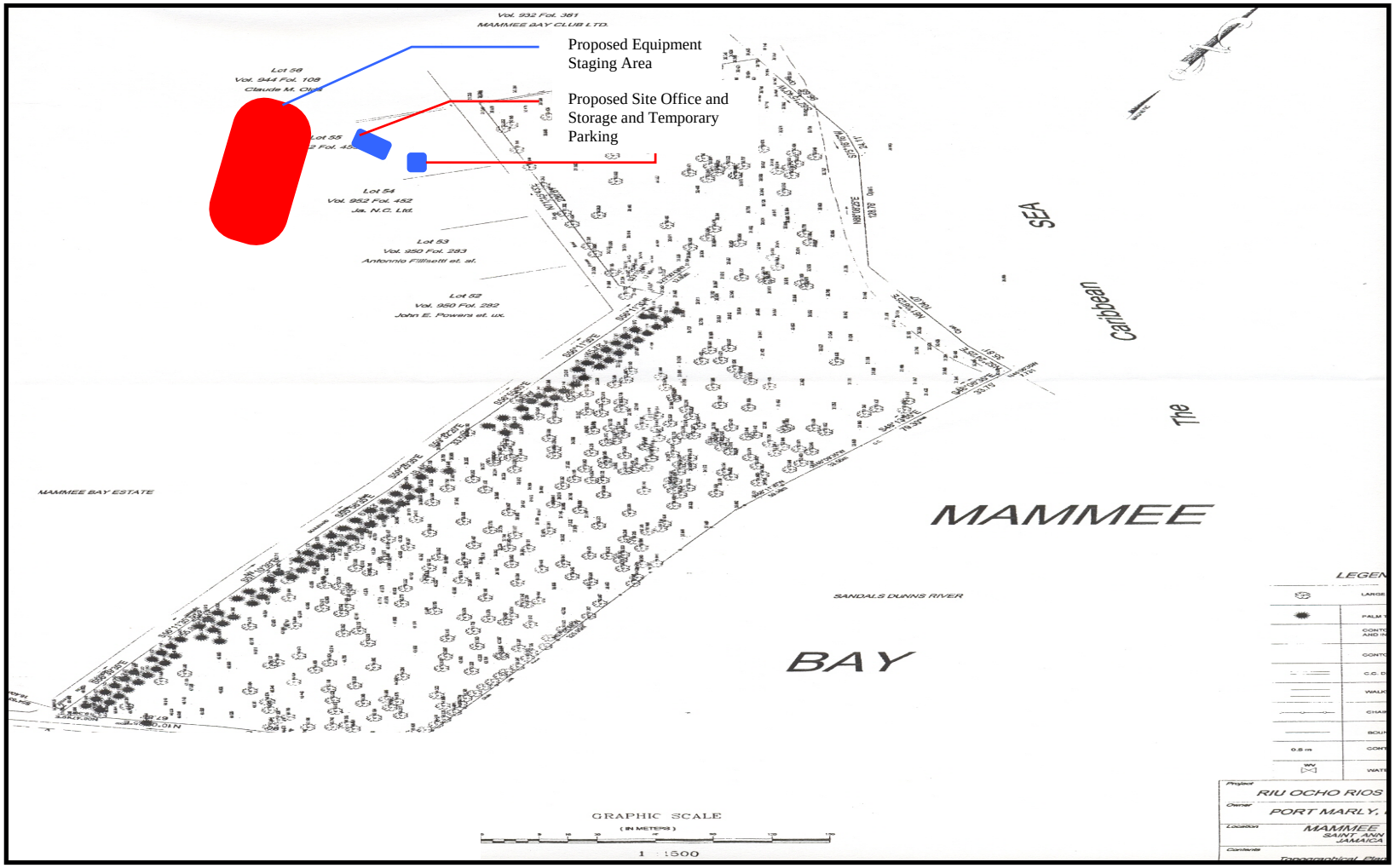
The construction phase of the proposed hotel development is scheduled to last approximately 18 months and will be similar in design to the first two hotels constructed by Riu in Negril and will consist of 846 rooms with a floor area of approximately 56,686 m^2 divided into three "buildings." For the purpose of this report, the buildings have been labeled "Building A", "Building B", and "Building C." Buildings A, B, and C will comprise rooms inclusive of double and triple occupancy and suites, with "Building B" also housing the main lobby area, entertainment areas, restaurants and administrative area. Building A comprises 361 rooms and is five (5) stories high. Building B comprises two sections, a one story building which houses the offices, main lobby area and a small restaurant and a second section with the main dining area, main kitchen and delivery on the first floor and 137 rooms to a total of seven (7) stories. Building C houses 348 rooms and is six (6) stories high. The buildings for the proposed development are situated towards the northern section of the property and will be constructed primarily of block and steel walls with concrete roofs. The buildings will have ornamental finishes such as roof finials, ornamental aluminum railings on balconies and decorative finishes to the façade of the building.

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. Temporary buildings will be utilized onsite during construction for storage and field offices. These buildings will be removable containers and are temporary structures on the site. The proposed equipment staging area and location of temporary storage and office buildings are presented on Figure 3. 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. There will be no one residing on the site during the construction phase; all staff will be housed in surrounding areas off the site. Provisions will be made for temporary parking (mostly for office staff) close to the temporary site offices.

This development will include facilities typical of a resort hotel, including but not limited to shops, spa, bars, swimming pools, restaurants, entertainment, sports and recreation areas, support facilities, and a sewage treatment plant. There is, however, currently no plan by the developers to construct any structure, which will encroach or modify the foreshore and or the floor of the sea. The Site Layout Plan is presented as Figure 4.

FIGURE 3 SITE LAYOUT SHOWING RELATIVE POSITIONS OF EQUIPMENT STAGING, SITE OFFICE, AND TEMPORARY PARKING AREAS



The proposed development has a plot area ratio of 19,980.86 m^2 on a site that consists of 138,678.05 m^2 (approx. 34.5 acres). Approximately one quarter of the available lands will be preserved in its existing state (more or less) with brush removal and landscaping being done to maintain the aesthetic of the development and the area. This area to be preserved comprises the southeastern end of the property from the parking areas to the shared boundaries with both Sandals Dunn's River and Mammee Bay Estates. Mature trees will be left in place, including the royal palms that line the entranceway into the facility. This same area (southeastern end) will be utilized during the construction phase to locate the field office, general equipment parking and staging of supplies. Adequate parking for the hotel is situated towards the southern side of the site. All structures to be built on the site will adhere to and fall within the regulations and standards of the St. Ann Parish Development Order and the Natural Resources Conservation Act of 1991, which is enforced by the statutory body, the National Environmental Planning Authority (NEPA).

2.1 SEWAGE/WASTEWATER TREATMENT

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 is approximately 3:1

Based on a design of 850 rooms and an estimated wastewater generation rate of 1.4 m^3/room/day (369.84 gals/room/day) it is anticipated that 1,190 m^3 (314,362 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) and is designed to process a daily volumetric capacity of 1,400 m^3 (369,841 gals), which provides a 15% (210 m^3 or 55,476 gal) contingency over the anticipated volume at maximum capacity.

The physical structures that will comprise the sewage treatment system will be constructed in the upper southeast corner of the property along the property boundary

with Sandals Dunn's River Resort (See Figure 4 – Site Layout). 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. A schematic of the proposed sewage treatment process is provided below as Figure 5.

FIGURE 4. SITE LAYOUT PLAN OF THE PROPOSED DEVELOPMENT, MAMMEE BAY, ST. ANN

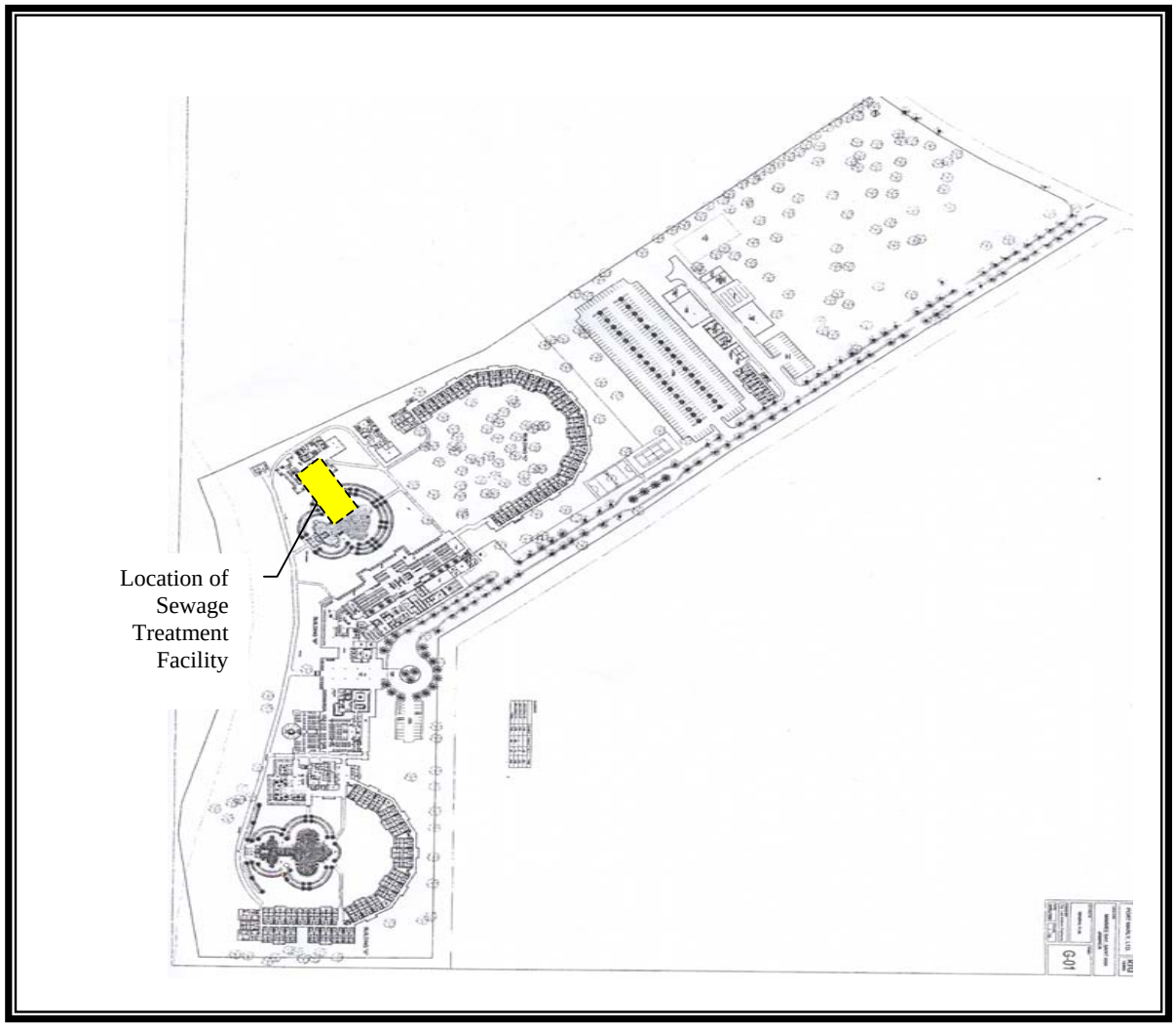
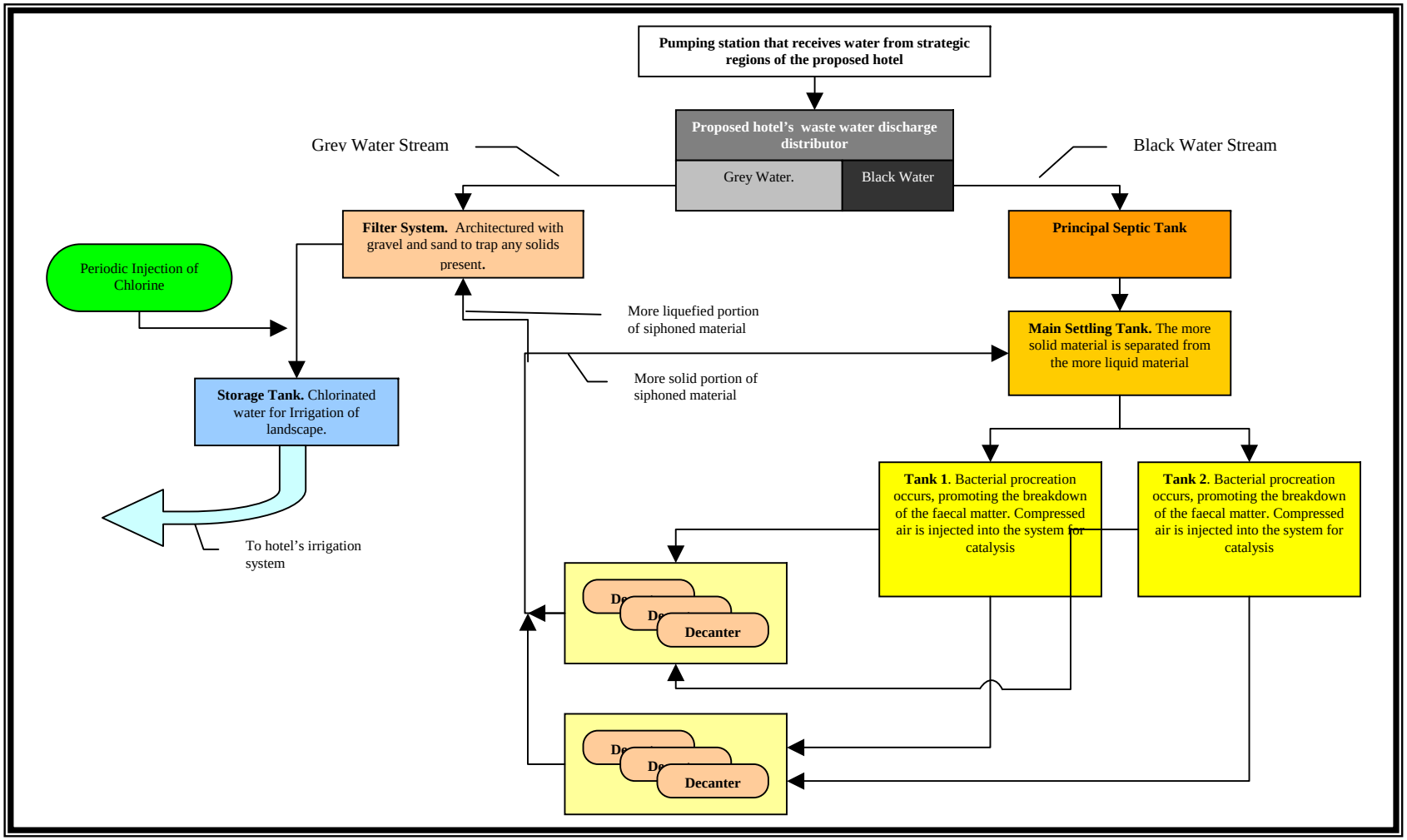


FIGURE 5 SCHEMATIC OF THE PROPOSED SEWAGE TREATMENT PROCESS



The treatment process will be as follows:

- Effluent will be collected from various sections of the hotel via a series of pumping stations located at strategic points within the site and passed on to a principal septic tank.
- From the principal septic tank, the wastewater will be passed to a main collection tank that facilitates settling and is the beginning of the separation process.
- The mostly liquid portion of the waste material is then transferred from the main settling tank to three (3) large oxidation tanks each with a capacity of $34m^3$ (8,976 gals). It is within these three tanks, that bacterial procreation will occur to promote the breakdown of the faecal matter. This reaction will be further enhanced with the aid of compressed air being injected into the system.
- With the completion of the bacterial breakdown process, the liquid is passed to four (4) sets of two (2) decanters or secondary settling tanks. In these eight (8) tanks, the liquid portion of the wastewater is progressively siphoned off and channeled away, with the more solid portions being re-circulated to the main settlement tank where the process begins again.
- The decanted liquid is now channeled to a $34m^3$ (8,977 gallons) pre-filtered storage tank, from which the treated wastewater is pumped through a gravel and sand filtration system for polishing prior to entering the irrigation vault.
- On the way to the irrigation vault, chlorine is periodically injected into the system as a final treatment step.
- At this point, the water is suitable to be utilized for irrigation of the landscape on the property.

The proposed sewage treatment system has the following advantages, which led to its selection over other methods:

- Simplicity
- Ease of operation
- Ease of maintenance
- Low cost of operation and maintenance
- Availability of land space
- Quality of treated water
- Odour free

FIGURE 6(A). PROPOSED SEWAGE TREATMENT SYSTEM RIU - MAMMEE BAY. LATERAL SECTIONED ELEVATIONS

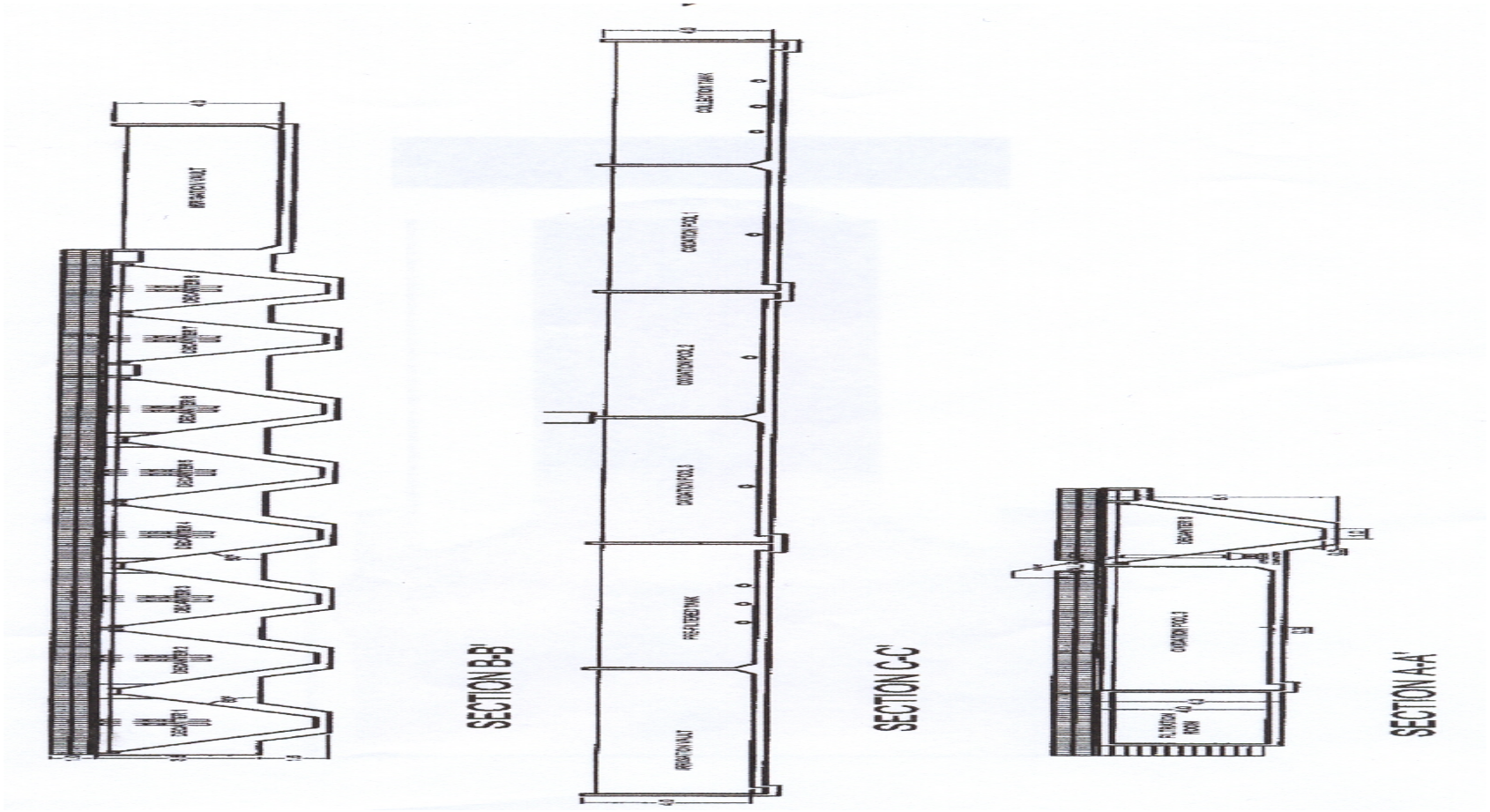


FIGURE 6(B). PROPOSED SEWAGE TREATMENT SYSTEM RIU - MAMMEE BAY. UPPER LEVEL PLAN ELEVATION

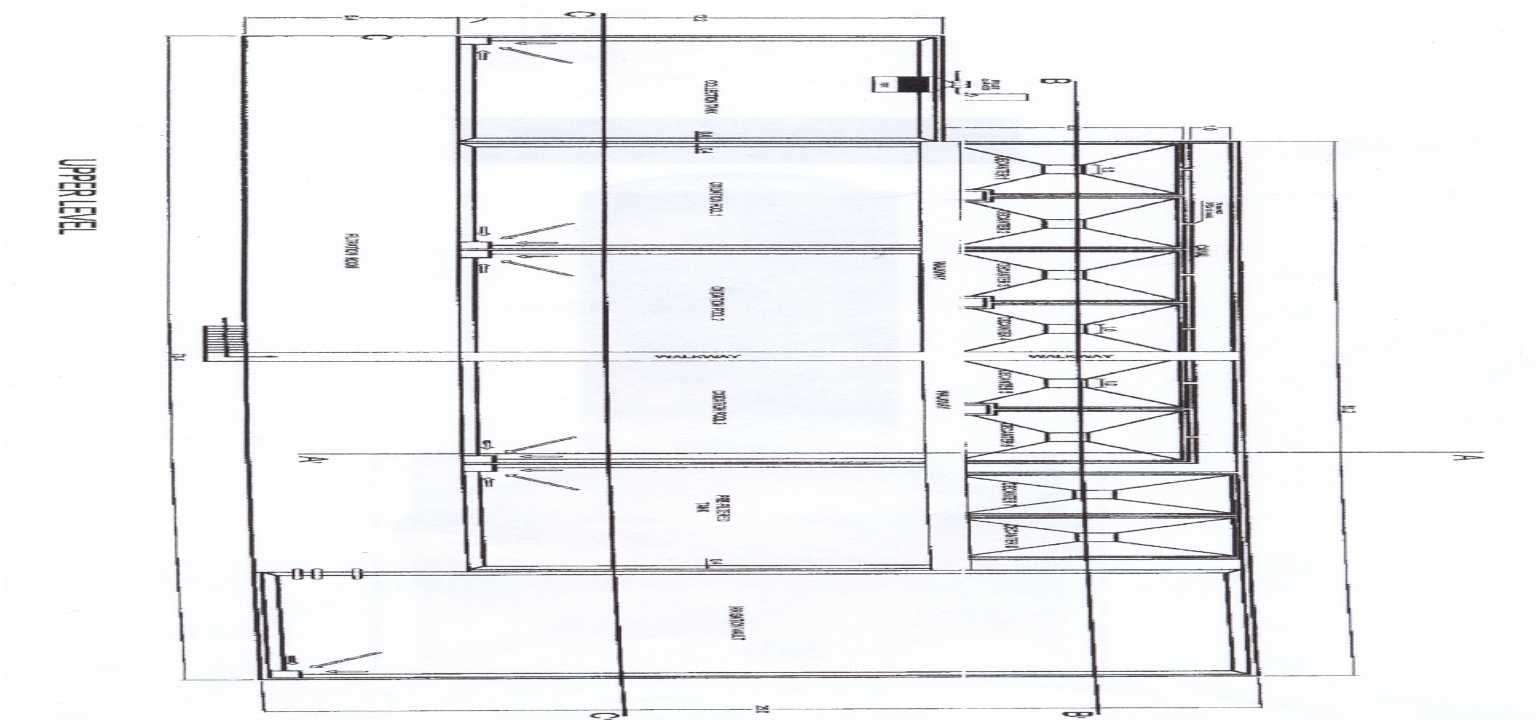
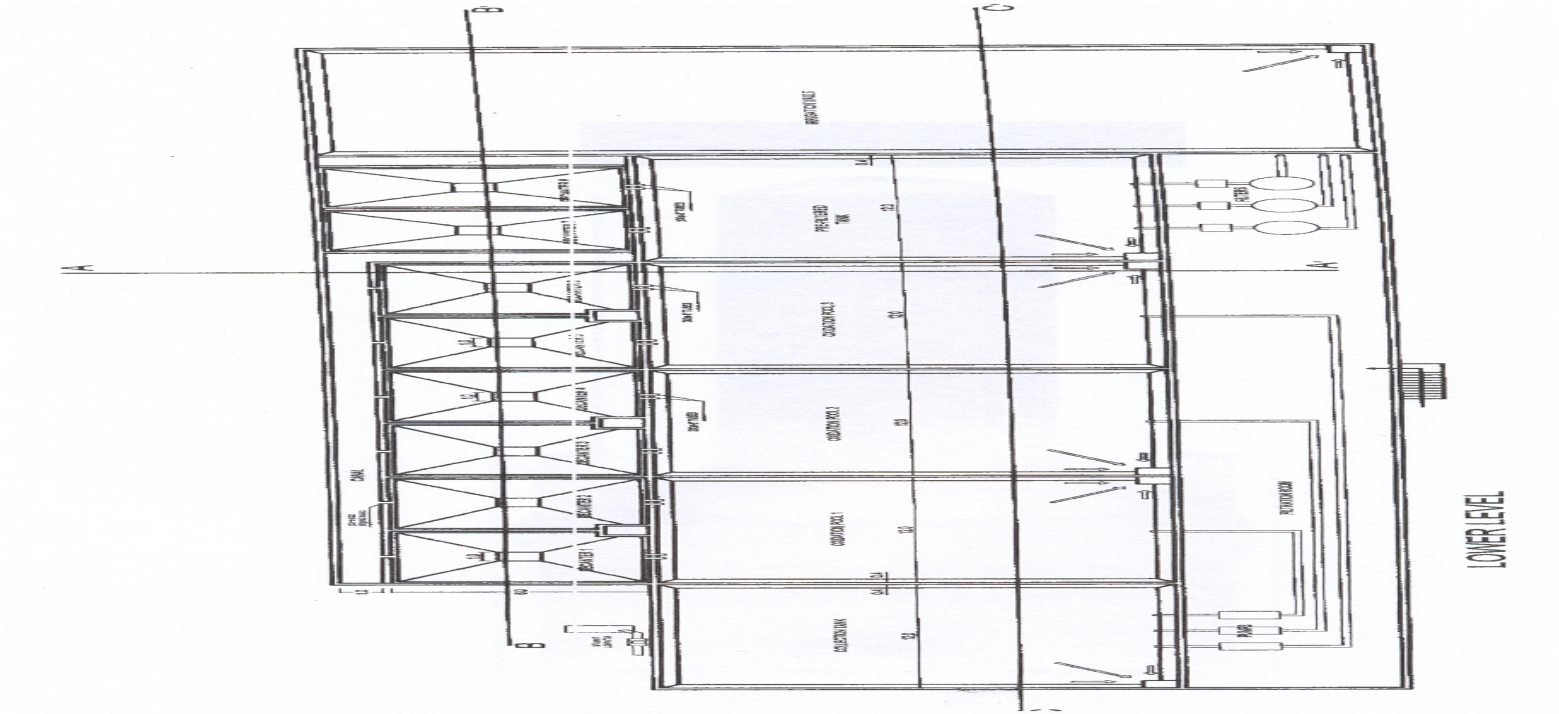


FIGURE 6(C). PROPOSED SEWAGE TREATMENT SYSTEM RIU - MAMMEE BAY. LOWER LEVEL PLAN ELEVATION



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. Keep in mind 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 system has been located along the property boundary with the Sandals Dunn's River Resort in proximity to that facility's existing sewage treatment system. That location is situated to minimize the potential for impact (aesthetic) to Sandals, the neighbouring residential community and the proposed development. Appropriate laybacks will be observed during construction.

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 – NEPA Sewage Effluent Guidelines

PARAMETER	EFFLUENT LIMIT
BOD_5	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	1000 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 2 – 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.

2.2 UTILITIES

2.2.1 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 1,832,139 litres/day (484,000 gals/day) of water at maximum capacity during the operational phases of the development. As a condition of purchase, the National water Commission (NWC) committed to meet the water supply needs of the development if it is implemented. A copy of the letter from JAMPRO to the NWC requesting confirmation that the NWC can in fact meet the demand of the facility if it is constructed, and the NWC's response indicating their ability to provide the necessary water resources have been included as APPENDIX A. It is anticipated that the source of the water will be additional to that which presently supplies the communities of Mammee Bay Estates, Greenwich Park and Steer Town and will come from the Bogue water supply system. Water for the facility will be taken off a new 12 inch main which is being run from Drax Hall to Dunn's River to replace the existing 8 inch main. This new 12-inch water main will then tie into the existing 24-inch line that supplies Ocho Rios. Residents of the community have shown some concern about NWC's ability to supply the water necessary for the development without affecting their existing supply, primarily through low-pressure service or frequent loss of service. In addition, the residents are concerned about NWC's stepped approach to upgrading water supply in the area and would rather see the proposed 12 inch main upgraded to 18 inch or even 24 inch at this time rather than later. The NWC has given the developers the assurance that water will be made available for the project.

2.2.2 ELECTRICITY DEMAND

The hotel is estimated to use approximately 847,200 kW/month during the operational phase at maximum occupancy. Electrical power will be supplied from the Jamaica Public Service Company (JPS Co.) service lines. A JPS Co substation is located within one mile

of the proposed development and it is not anticipated that there will be any issues related to availability or supply of electrical power to the development. 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.

2.3 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.

SECTION 3: DESCRIPTION OF THE ENVIRONMENT

3 DESCRIPTION OF THE ENVIRONMENT

The study area extends from the Mammee Bay Estate property boundary to the west, to the Sandals Dunn's River property boundary to the east, and from the Caribbean Sea on the north to the Mammee Bay main road to the south (Figure 2).

3.1 PHYSICAL ENVIRONMENT

3.1.1 CLIMATE

The parish of St. Ann receives an average of 1,016 mm (40") of rainfall per year and has two distinct rainy periods, between the months of May and June and from October to November. The driest period occurs from January to March, with less than 127 mm (5") per month. Temperatures are relatively constant throughout the year, but range from 21 ^{0}C to 32 ^{0}C during the hottest months and 18 °C to 28 °C during the colder 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 64 miles to the west 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 east-northeasterly 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.

Hurricanes are a serious seasonal threat from July 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 designed.

3.1.2 TOPOGRAPHY AND GEOLOGY

3.1.2.1 General Topography and Geology

Elevations at the site increase gently from sea level along the shoreline to a maximum of 20.35 metres above sea level along the boundary with the St. Ann's Bay to Ocho Rios main road. The soil at the shoreline is a part of the Falmouth Formation, and consists of coarse, poorly sorted, calcareous sand with numerous smooth pebbles. However, the dominant lithology of the site is the Hopegate Formation. 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 at the site. This potential is acknowledged and will be mitigated during such events. During the assessment of the site, no obvious sources or existing pollution or contamination was observed across the project area.

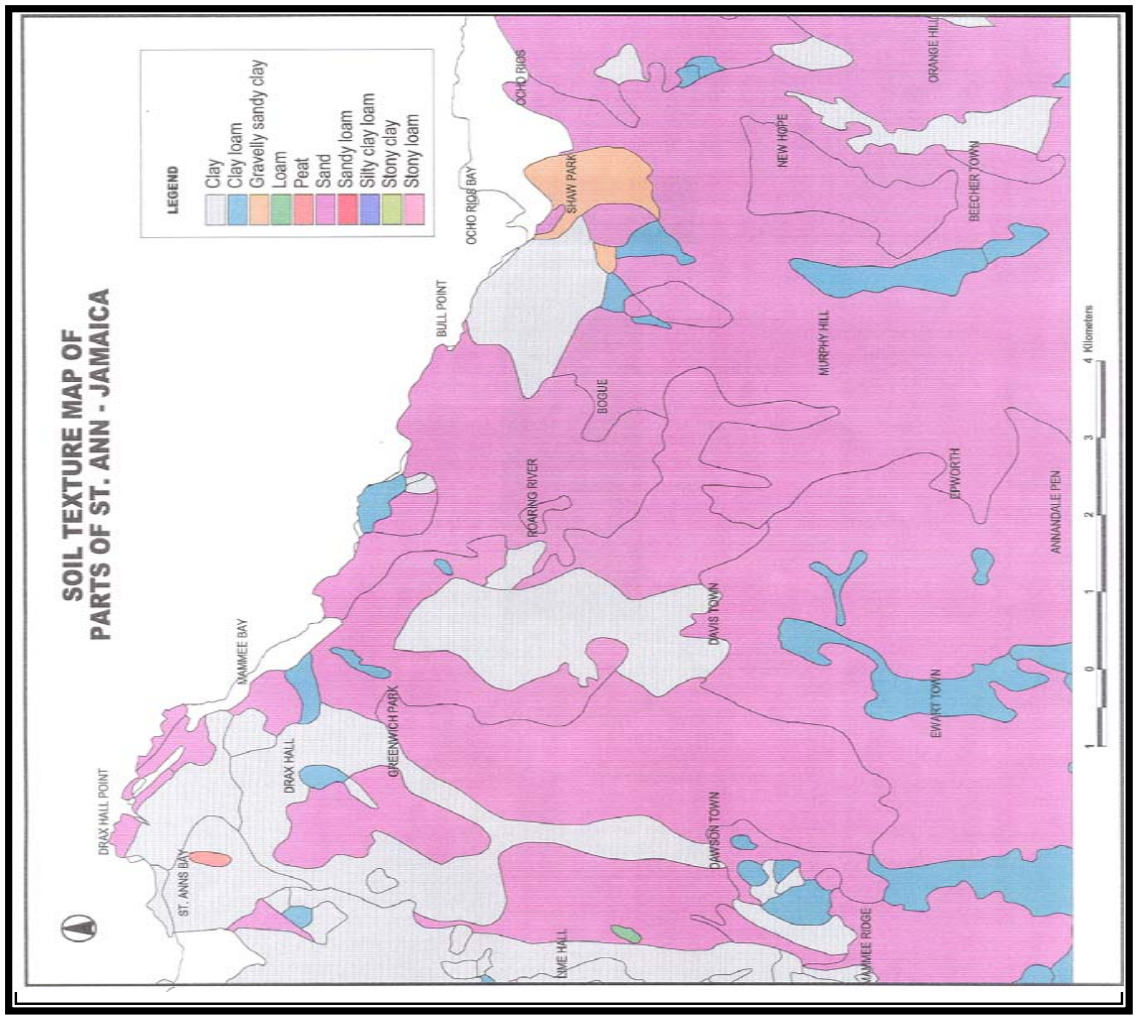
3.1.2.2 Beach Topography and Geology

Along the beach, the substrate depth ranged from 0 cm to 10 cm, and consists of coarse, angular, highly sorted carbonate sand grains with large pieces of coral and marine tests. This suggests recent (less than 50 years) storm surge deposits. Sediments on the sandy shore are composed of large, poorly sorted, angular sand grains, 50% of which were larger then 125 mm.

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 site requires any special considerations prior to a development such as the one proposed being implemented. As mentioned, the developers will incorporate erosion controls during the construction and operational phases.

FIGURE 7 SOIL TEXTURE MAP OF PARTS OF ST. ANN, INCLUSIVE OF THE PROPOSED SITE



3.1.3 WATER QUALITY ANALYSIS

No wells, rivers, ponds or streams are on the property proposed for this development. Only coastal water resources occur naturally on the site. Water samples were collected just off the shoreline of the beach associated with the development, to determine the general water quality in the area. It must be recognized that the analytical results represent the instantaneous conditions at the time of sampling, and are not a continual detailed characterization of the water quality. Such a characterization would only be possible in a study conducted over a period of at least one year under varying conditions. During the collection of the coastal water samples, no obvious sources or existing pollution or contamination was observed.

- The water samples were collected in sample containers provided by the analytical laboratory, Scientific Research Council (Analytical Services Department). Visually, the water was clear 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.

3.1.3.1 Analytical Results

Table 5 Results of water quality analysis conducted on samples collected at Mammee Bay, St. Ann

PARAMETER	ANALYTICAL METHOD	RESULTS	NEPA STANDARD
Ph	Meter	8.1	6.5 – 8.5
TSS (mg/L)	Gravimetry	8	
BOD (mg/L)		1.05	<30 mg/L
Nitrate (mg/L)		2.2	10
Total Phosphate (mg/L)	Spectrophotometer	0.05	5.0
Faecal Coliform (MPN/100ml)	MPN Tubes	<3	< 100
Total Coliform (MPN/100ml)	MPN Tubes	<3	<500
Conductivity (uS/cm)		4200	

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. In addition, no structures are proposed for construction that will impact on the sea floor or the marine environment.

3.1.4 NOISE ASSESSMENT

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 Sandals Dunn's River ranged between 40db to 68db
- Noise levels measured along the property boundary with Mammee Bay Estates ranged between 36db to 63db
- Noise levels measured along the property boundary with the Mammee Bay main 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 main road is more than likely due to the movement of vehicular activity along the roadway. 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 insure that the comfort of residents in the community is appreciated.

3.1.5 STORM WATER MANAGEMENT

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 channeling 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 it way to groundwater.

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 will be generated on the roadways, which are proposed for upgrading as part of the Highway 2000 project.

3.1.6 SOLID WASTE MANAGEMENT

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.

3.1.6.1 Pre-construction

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.

3.1.6.2 Construction Phase

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.

3.1.6.3 Occupational Phase

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 VEGETATION

The project site is a coastal plot in an existing residential/resort area known as Mammee Bay. The site comprises 13.87 hectares and is one of few remaining undeveloped plots in the estate. It appears that the site had been previously cleared (probably for development) but was allowed to re-vegetate 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.

Approximately 2m from the water's edge, beach pioneer plants such as *Laguncularia racemosa* (White mangrove), *Coccoloba uvifera* (Sea grape) and *B. maritima* (Salt wort) were present. This vegetation type continued approximately 2 m inland, where it integrated with the other coastal plants.

The majority of the vegetation of the site consisted of mature tree species, ranging in height from 2m - 3m (6ft - 9ft). The shrub layer was not well represented, and large areas under the canopy of the trees were bare. In the open, unshaded areas, a well-developed

herb layer of *Sesuvium portucalastrum* (Seaside purslane) and *Ipomea sp*. were apparent. The species present on the site are typical coastal species, which are adapted to hot, salty conditions. The dominant plant was Seaside Mahoe (*Thespesia populnea*), a tree common in coastal locations.

Thirty (30) plant species were recorded, none of which are endemic, rare, threatened or endangered. Additionally, none of the plants have significant cultural or economic value. However, a number of these species are attractive and a recommendation has been made to the developers (which they have included in the design) to save as many of the trees and if possible, incorporate them into the landscape design.

Table 3 – Observed Vegetation Species

FAMILY	SCIENTIFIC NAME	COMMON NAME
	B. maritime	Salt wort
*****	*****	Mahogany
*****	*Spathodea*	Flame of the Forest
Aizoaceae	*Sesuvium portulacastrum*	Seaside purslane
Amaranthaceae	*Achyranthes indica*	Devil's Horsewhip
Bombacaceae	*Ceiba pentandra*	Silk Cotton tree
Boraginaceae	*Cordia collococca*	Clammy Cherry
Boraginaceae	*Cordia sp*	-
Burseraceae	*Bursera simaruba*	Red Birch
Caesalpiniaceae	*Delonix regia*	Poinciana
Casuarinaceae	*Casuarina equisetifolia*	Willow
Combretaceae	*Conocarpus erectus*	Button mangrove
Combretaceae	*Laguncularia racemosa*	White Mangrove
Combretaceae	*Terminalia catappa*	Almond
Euphorbiaceae	*Jatropha curcas*	Physic nut
Euphorbiaceae	*Ricinus communis*	Castor oil nut
Gramineae	*Panicum maximum*	Guinea grass
Guttiferae	*Calophvllum calaba*	Santa Maria
Malvaceae	*Thespesia populnea*	Seaside Mahoe
Mimosaceae	*Pithecellobium arboreum*	Wild tamarind
Mimosaceae	*Pithecellobium unguis-cati*	Privet
Mimosaceae	*Prosopis juliflora*	Cashaw
Mimosaceae	*Samanea saman*	Guango
Moraceaee	*Cecropia peltata*	Trumpet tree
Moraceaee	*Chlorophlora tinctoria*	Fustic tree
Myrtaceace	*Pimenta dioica*	Pimento
Palmae	*Cocos nucifera*	Coconut
Palmae	*Roystonea princeps*	Royal Palm
Polygonaceae	*Coccoloba uvifera*	Sea Grape
Sapindaceace	*Blighia sapida*	Ackee

***** Common names do not match list in literature consulted

Although the vegetation of the site is not ecologically significant it does have the potential to support fauna.

3.2.2 FAUNAL SURVEY

Five (5) bird species were observed on the site, one of which, the Red-billed Streamer Tail, is endemic. The species were observed feeding, indicating that the site is used by the species for their ecological activities. Table 4 below, provides a listing of avifauna observed on the proposed development site.

Table 4 Avifauna species observed on the proposed site at Mammee Bay, St. Ann

FAMILY	SCIENTIFIC NAMES	COMMON NAMES
Trochilidae	*Trochilus polytmus polytmus***	Red Bellied Streamer tail
Icterinae	*Quiscalus niger*	Greater Antillean Grackle
Coerebinae	*Coereba flaveola*	Bananaquit
Mimidae	*Mimus polyglottos*	Northern Mockingbird
Tyrannidae	*Tyrannus caudifasciatus*	Loggerhead kingbird

** Endemic

In addition, at least 20 burrows belonging to the species *Cardisoma guanhumi* (Great land crabs) were observed on the site.

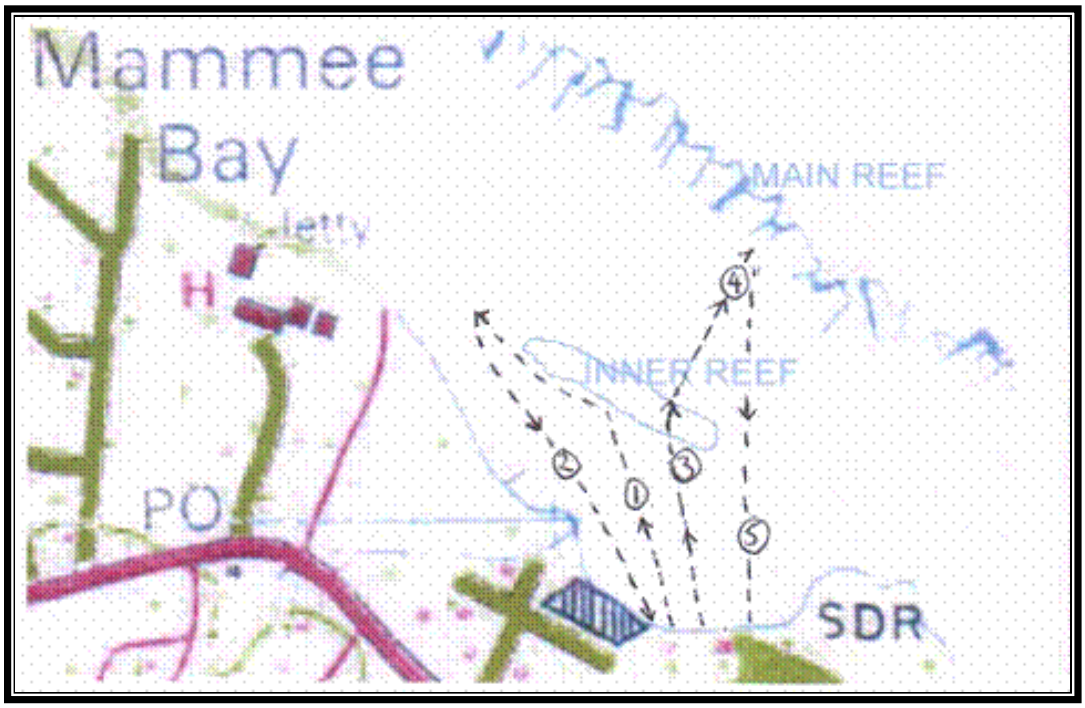
3.3 MARINE ENVIRONMENT

3.3.1 REEF ASSESSMENT

A marine assessment was conducted of the marine environment in the area at five (5) locations in the vicinity of the proposed development (Figure 7). 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 sites assessed are:

- **Site 1**: The Shore East of the Mammee Bay Beach Club to the Front section of the Inner Reef
- **Site 2:** West of the Small Inner Reef and back to Shore;
- **Site 3:** From Shore, West of the Mammee Bay Beach Club, towards the Eastern Limits of the Inner Reef, going along to the back of the Inner Reef
- **Site 4**: Region extending from the Shore, West of the Mammee Bay Beach Club, towards the Eastern Limits of the Inner Reef, going along to the back of the Inner Reef.
- **Site 5:** Traveling South-East from the edge of the Main Reef towards the Shore line.

FIGURE 8 MARINE VIDEO-GRAPHED SURVEY SITES FOR THE RIU OCHO RIOS HOTEL DEVELOPMENT.

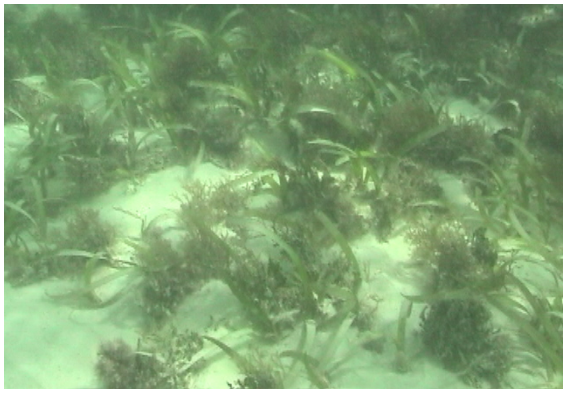


Site 1: The Shore East of the Mammee Bay Beach Club to the front section of the Inner Reef

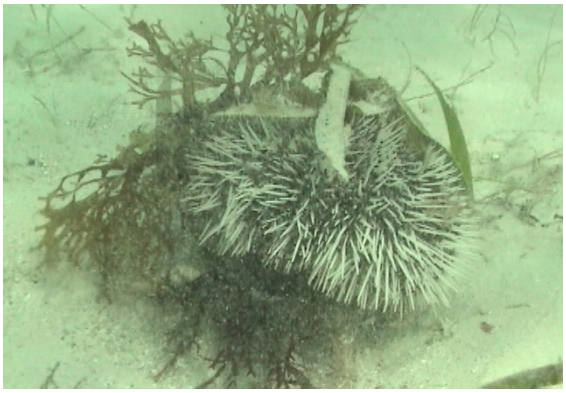
Snorkeling was conducted in waters extending from the shore, just east of the Mammee Bay Beach Club, to the front section of the inner reef, in waters approximately 0m-2.13m (0ft-7ft) in depth. Few fish species were seen in the first few meters of this area, however, a Peacock Flounder ***(Bothus lunatus)*** was sited. There was a high density of West Indian and Variegated sea eggs ***(Tripneustes ventricosus and Lytechinus varigatus*** respectively***)*** present in the areas farther away from the shore, and were frequently camouflaged among Manatee Grass (***Syringodium filiforme***) and Turtle Grass (***Thalassia testudinum)***. The potpourri of grasses and sea-eggs increased consistently towards the front of the inner reef with the Turtle Grass (***Thalassia testudinum***) appearing longer and thicker. The substrate was hard, and comprised calcium carbonate ($CaCO_3$). The inner reef appeared active with marine life inclusive of plant and simple animal species. The greatest number of fish species were observed in this site area and were also the ones commonly associated with reef systems. The observed fishes included**:** ***Stegastes fuscus*** (Dusky Damselfish), ***Abudefduf saxatilis*** (Sergeant Major), ***Halichoeres garnoti*** (Yellowhead Wrasse), ***Thalassoma bifasciatum*** (Bluehead Wrasse), ***Acanthurus* bahianus** (Ocean Surgeon) ***Sparisoma viride*** (Parrot Fish) and ***Pseudupeneus maculates*** (Spotted Goatfish).The fish species were generally small and juvenile. The largest fish species that was observed was the ***Acanthurus* bahianus** (Ocean Surgeon)

Numerous anemones were present as well as Green and Red algae, Y-Branched algae and Water Cress algae (***Halimeda opuntia***). On the underside of a boulder coral a formation resembling Spiny Flower Coral (***Mussa angulosa***) was observed. Examples of small areas of encrusting/ mound corals were also observed.

PHOTO INVENTORY



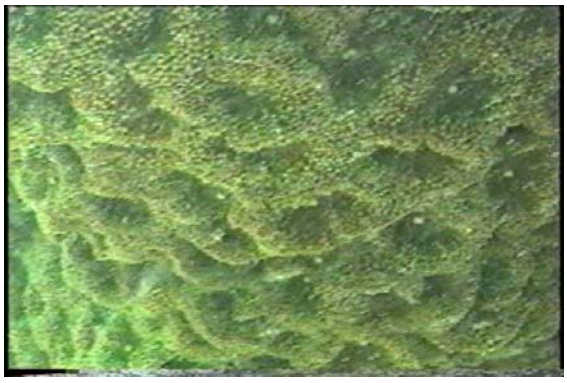
Turtle Grass ***(Thalassia testudinum)***



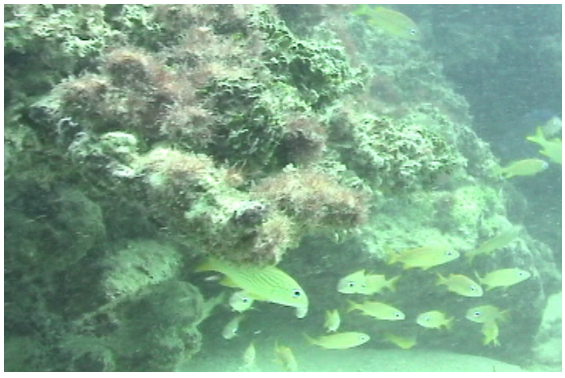
West Indian Sea Egg ***(Tripneustes ventricosus)***

Anemones ***(Condylactis gigantean)***

Ocean Surgeon Fish ***(Acanthurus bahianus)***



Possibly Spiny Flower Coral ***(Mussa angulosa)***



French Grunt ***(Haemulon flavolineatum)***

Site 2: West of the Small Inner Reef and back to Shore

Water depth at this site (west of the front of the small Inner Reef towards reference point on the shore from Site 1) ranged from 2.13m-3.0m (7ft-10ft).

In moving further west along the front of the inner reef, the reef was more scattered and less protected, causing a slight 'rip' current out to the sea. The reduced visibility of this region of Site 2, was caused by the increased water movement that dispersed the fine sand at the sea-bottom through out the western portions of the Site 2 region. There were also patches of sand, Turtle Grass, and of sea-eggs that formed a natural undulating scheme, giving the impression of a dune-like landscape, thereby characterizing the western section of the Site 2 region. A group of six reef squids (***Sepioteuthis sepioidea)*** was also observed in this area.

Towards the reference point on the shore of the Site 1 region, moving away from the reef in a southeasterly direction, the ocean floor became less undulating and progressively consistent in its height perpendicular to the sea floor surface, with frequent occurrences of sea-grass and sea-eggs.

PHOTO INVENTORY

Slippery Dick ***(Halichoere bivittatus)*** – lower center right and center left; and Spotted Goat Fish ***(Psudupeneus maculates)*** - Far middle right lower center left.

Turtle Grass ***(Thalassia testudinum)***

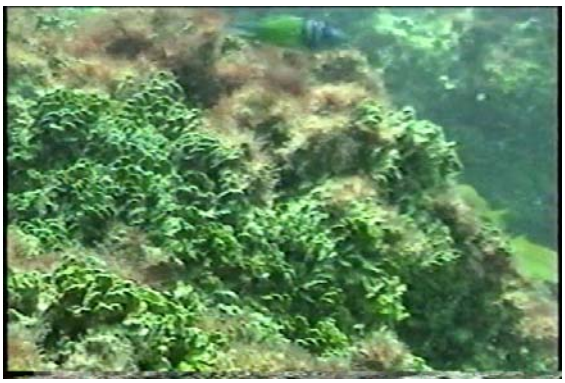
Site 3 – Region extending from the Shore, West of the Mammee Bay Beach Club, towards the Eastern Limits of the Inner Reef, going along to the back of the Inner Reef.

The survey of the physical environment of the marine life of Site 3 was observed over a depth range of approximately 0m - 3.05m (0ft-10ft). An abundance of thriving fish life was observed on the inner reef, particularly those of the Ocean Surgeon (***Acanthurus bahianus***) and the Grunt (***Haemulon flavolineatum***). Sea-eggs common to the area were also seen feeding on the inner reef as well as Sun anemones (***Stichodactyla helianthus***) and Giant anemones. Large amounts of Watercress, Red and Green algae were observed to have covered the existing coral formations. The Coral formations observed included Finger coral (***Porties porties***), encrusting/boulder Star coral (***Psammocora contigua***), sheet plate coral, Mustard Hill coral (***Porites astreoides***), Gorgonian coral (***Calcigorgia spiculifera***). Tubeworms **(*Bispira brunnea*)** were also observed in the area.

A sandy bottom met the backside of the inner reef.

PHOTO INVENTORY

West Indian Sea Eggs ***(Tripneustes ventricosus)*** – Far center right, top centre and upper centre left; and Sergeant Major ***(Abudefduf saxatilis)*** - centre



Watercress Alga ***(Halimeda opuntia)***; Red Alga ***(Phylum Rhodophyta)*** and Bluehead wrasse ***(Thalassoma bifasciatum)*** – top centre

Possibly White Encrusting Zoanthid ***(Palythoa caribaeorum)*** or Knobby Star Coral ***(Solenastrea hyades)***

Sun Anemone ***(Stichodactyla helianthus)***

Site 4 – Region between the back of the Inner Reef and the front of the Main Reef

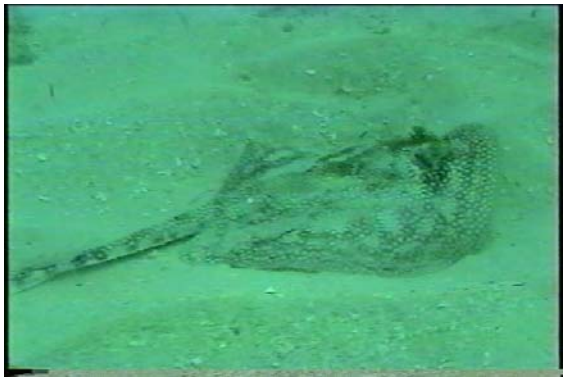
The survey of the physical environment of the marine life of Site 4 was observed over a depth range of approximately 3.05m - 4.57m (10ft-15ft). The sandy bottom that met the backside of the inner reef was characterized by a defined ridge and valley pattern, which showed the transition between the inner reef area and the progressing sea floor which extents towards the main reef. Small clumps of young coral and the heads of coral sporadically located throughout the site; along with sea-eggs and anemones, populate the floor of the sea-bottom of Site 4. The sporadically located corals are mostly attached to individual boulders, whose isolated existence are likely the result of damage sustained by the reefs through biological processes, and the inevitable effects of weathering caused by the action of the strong sea currents in the area which remove sections of the reef. Some

of these corals include large brown Gorgonians corals (***Calcigorgia spiculifera***) and Fan corals (***Gorgonia flabellum***).

Parrot fish (***Scarus taeniopterus)*** and Squirrel fish (***Holocentrus adscesionis***) were also observed to be apart of the marine environment. In addition to these, a Golden tail moray eel was seen hiding in a clump of branching finger coral, and a Yellow sting ray (***Urolophus jamaicensis*)** was also observed along the sea-floor of the area.

The landscape of the sea floor in this area is more undulated than the previous site regions and becomes more undulating as progression is made towards the main reef.

PHOTO INVENTORY

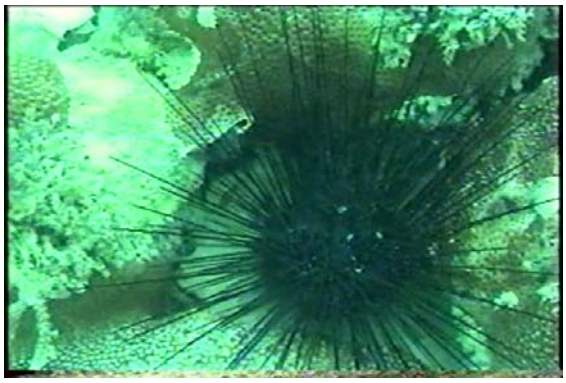


Yellow Stingray ***(Urolophus jamaicensis)***

Anemones ***(Condylactis gigantean)***

Variegated urchin & anemone

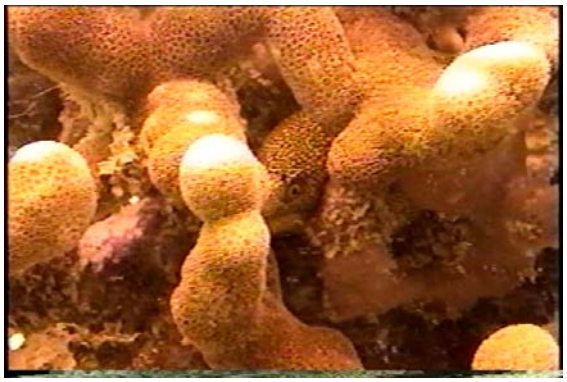
Group of Variegated Sea urchins (***Tripneustes ventricosus***)



Black Sea urchin *(Strongylocentrotus purpuratus)*

Branched-Finger coral ***(Porites porites)* –** Wide center; and Bluehead wrasse ***(Thalassoma bifasciatum)*** – Top left centre

Black Sea Rod ***(Pleaura homomalla)***



Goldentail Moray ***(Gymnothorax miliaris)*** – Hidden in the center

Bluehead wrasse ***(Thalassoma bifasciatum)***

Site 5 – Traveling Southeast from the edge of the Main Reef towards the Shore line.

The bottom was generally sandy and clear – there were neither rocks nor corals observed. The area was scattered with empty bottles and sea-eggs that were becoming encrusted with shells and algae. A Cushion starfish (***Oreaster reticulates***) was also seen in the site area.

Human activity above and below the sea surface generally characterized the area, with snorkeling, which was facilitated by a catamaran and glass bottom boat, along with windsurfing and parasailing characterizing the extent of such activity in the area.

PHOTO INVENTORY

Empty Bottles

Sea Eggs and Algae are becoming encrusted

Wind Surfer

Snorkeling from Catamran

3.4 SOCIO-ECONOMIC SURVEY and CULTURAL CONSIDERATIONS

3.4.1 DEMOGRAPHIC PROFILE

The project is proposed for an area with a total impact population of 1128 (509M, 619F) (Table 5). The table shows the distribution of the populations by ED, age and sex structure. Mammee Bay itself (ED 29) has a low population density. In 1991 the total population was 491 (207M; 284F). Most of the population is in the economically active age group (15-64).

3.4.2 URBAN SETTING

The project is proposed for a designed resort area. The core of the proposed area is along the north coast, which forms an important part of a development strategy, which sees tourism, agriculture and mining as important elements of the economic base of the region.

Table 5 Impact Population of the Mammee Bay Area by ED, Age/Sex Structure

	MALES				FEMALES			
Area	**0-14**	**15-64**	**68+**	**Total**	**0-14**	**15-64**	**68+**	**Total**
ED 28	47	152	8	207	81	195	8	284
ED 29	117	4	302	302	125	202	8	335
Subtotal	164	333	12	509	206	397	16	619

Total Impact Population 1128 (509M; 619F)

The parish capital, St. Ann's Bay (population 10,961) is west of the project area, and the town of Ocho Rios, the second largest tourism centre (population 8,189), is east of the project area. This is the context within which we are to view Mammee Bay - a suburban, private residential area.

3.4.3 RESIDENTIAL DEVELOPMENT

The Mammee Bay Estate began as a private resort over thirty-five years ago. Since that time the community has grown from a private resort estate to an upper-class private

residential community. In July 1989, permission was granted by the St. Ann Parish Council for the erection of sixty-five (65) apartments. The notion behind the development of Mammee Bay, that of the 'villa concept' laid the foundation for its subsequent development as a private residential area. It was designed for families to live and vacation in peace and tranquility. A close-knit community has emerged in which there is a strong sense of solidarity and concern for the welfare of the community members. This provides a sense of security, friendship, and close personal ties. At present, there are approximately:

- 70 permanent residences on the estate
- 20 homes (eight of which are partial rentals)
- 57 vacant lots
- 8 commercial lots

3.4.4 SOCIAL ENVIRONMENT

The survey used a sample size that would be representative of the population of the communities. The social survey was administered to Fifty (50) households within the project area (including Mammee Bay, Mammee Bay Estates, Greenwich Park and Steer Town) which constituted approximately 4.5% of the area population, while incorporating over 10% of the households in the area.

Ninety-two percent (92%) of those surveyed indicated an awareness of the proposed development, with six percent not aware and two percent not commenting. Ninety-four percent (94%) of the households surveyed, indicated that they were in favour of the development, with seventy-two per cent (72%) indicating that they were 'in favour' and twenty-two percent (22%) indicating that they were 'strongly in favor' of the proposed resort development. Further, ninety-six percent (96%) of the respondents indicated that they were looking forward to the proposed development with only four percent (4%) of the respondents stating that they were not looking forward to the development. Of the 96% who were looking forward to the development being built, only twenty percent (20%) knew when the development was scheduled to begin construction, the remaining

80% were unaware but the overriding sentiment was optimism that the new development would benefit the community favourably by providing much needed employment, increase economic activity, and attract spin-off businesses to the area. Many of the respondents were hopeful that these types of developments would have a positive impact on the overall Jamaican economy.

While the majority of the respondents are looking forward to and in favor of the proposed RIU Ocho Rios Hotel development, a reasonable percentage (72%) are not convinced that the project will affect their livelihood, however they indicate that sufficient opportunities for employment and tangible jobs are guaranteed whether directly or indirectly by the development.

3.4.5 ENVIRONMENTAL IMPACTS

When asked if they believed the planned development would affect the availability of their resources, forty-four percent (44%) said Yes. 95% of those who indicated that they believed their resources would be affected, indicated that the impacts on their water supply was of most concern, particularly water pressure to the homes and reliable service. 14% indicated that electricity was of concern, while sewage, traffic and aesthetics were each mentioned by 4% of the respondents.

3.4.6 HEALTH IMPACTS

Concerns with health impacts related to the development was mentioned by very few of the respondents to the survey. The major issue that arose in this regard is the proper treatment and management of sewage generated at the facility. During a community meeting to discuss the proposed development, residents were very concerned about this aspect of the development and one attendee asked if a “guarantee” could be given that the sewage would be treated to the tertiary level and not be disposed in the sea.

3.4.7 CULTURAL AND HISTORICAL IMPACTS

A review was done on the known cultural and historical resources of the general area, inclusive of the surrounding landscapes and communities. It is believed that the indigenous Arawak or Taino people at one time inhabited areas along the north coast of the island, possibly including the proposed project area. There is no physical evidence at the site indicating the former existence of a "midden" or Taino community, however, if during excavation activities any artifacts are unearthed, the Archaeological Retrieval Plan outlined later in this document will be followed.

Additional potential cultural impacts include the disruption of the traditional use of the beach for bathing or fishing by residents of the community. The Prescriptive rights of individuals to use the beach for bathing and fishing are protected and a process is in place to facilitate this right if individuals seek to pursue it.

3.4.7.1 Archaeological Retrieval Plan

Historically, it is known that the indigenous people of the island, Arawaks or Tainos inhabited the northern coast of the island. While no physical evidence exists at this time, there is a possibility that the site proposed for this development may have once included a "midden" or Taino community. In the event that artifacts or items of cultural or historical significance are unearthed (or there is uncertainty), the following Archaeological Retrieval Plan will be followed:

Action 1: Stop excavation and all other works in the general area

Action 2: Notify the Jamaica National Heritage Trust at 922-1287-8 or 967-8059. Inform them of the situation and request that they visit the site and verify the finding.

Action 3: If the find represents an artifact or items of cultural or historic significance, the JNHT will take control of that portion of the site and make the necessary arrangements to secure, remove and process the find.

Action 4: Construction work at that location will only continue on the order of the JNHT.

3.4.8 COMMUNITY MEETINGS

In an attempt to address concerns of residents and other stakeholders from the area, the developers and their representatives have attended two (2) meetings within the community. The first meeting was held on May 2, 2004 at a private residence in Mammee Bay Estates and was hosted by the Mammee Bay Estate Citizens Association. Concerned residents in the area called this meeting to discuss major issues associated with the proposed development. Approximately 15 individuals attended the meeting from Mammee Bay Estates and surrounding communities including Steer Town and Greenwich Acres. Issues discussed were relevant to the development and included:

- Sewage Treatment
- Water Supply
- Status of Approvals from NEPA and Parish Council
- Building Height and Density
- Drainage
- Dust Suppression and Fencing

The residents voiced their opinions and where possible, information was provided by representatives of the developers, JAMPRO and NWC. Several outstanding issues

remained at the end of the meeting and it was agreed that a follow-up meeting may be necessary to complete the dialogue.

A second meeting was convened by the Mammee Bay Estate Citizens Association on May 2, 2004 to get an update from the previous meeting and receive more detail on some areas of concern. This meeting was held at the Mammee Bay Beach Club and was attended by approximately 43 individuals from Mammee Bay Estates and the surrounding communities including Greenwich Acres and Steer Town along with representatives of the developers and government agencies. At this meeting, there appeared to be more support for the project, however, the major issues (some of which were unresolved from the March 15, 2004 meeting) were still in the forefront of the discussions. These included:

- Water Supply
- Sewage Treatment to Tertiary Level
- Regulatory Standards being used
- Building Height and Density
- Visual and Aesthetic Concerns
- Storm water Management
- Dust Suppression

At the end of the meeting, some issues had been sufficiently addressed, however, others such as water supply and building height and density were still unresolved. It was agreed that the developers would furnish copies of the final design drawings to the Citizens Association as soon as they became available.

SECTION 4: POLICY, LEGISLATION, AND REGULATIONS

4 POLICY, LEGISLATION AND REGULATIONS

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.

4.1 Agenda 21

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 center 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.

4.2 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.

4.2.1 St. Ann Parish – Town and Country Planning Provisional Development Order, 1998

The St. Ann Developmental Order includes:

Section 5: Permitted development

Section 6: Approval of planning permission

Section 7: Prohibition of development

Section 8: Outline planning permission

4.3 *RELEVANT LEGISLATION*

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

4.3.1 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 submittal 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)

4.3.2 THE BEACH CONTROL ACT (1956)

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.

4.3.3 THE PUBLIC HEALTH ACT (1974)

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 Heath 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.

4.3.4 JAMAICA NATIONAL HERITAGE TRUST ACT (1985)

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.

4.3.5 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.

4.3.6 THE NATURAL RESOURCES (MARINE PARKS) REGULATIONS, 1992

This Act regulates activities relevant to the use of areas designated as Marine Parks across the Island. In this case, the closest Marine Park is the Ocho Rios Marine Park. Sections of this Act relevant to this proposed development include:

Offences – 4: Removal or destruction of natural features and marine life
5: Dredging, filling, excavation and building activities
6: Refuse and polluting substances
7: Markers
10: Litter, waste material
15: Refusal to comply with orders – penalty $50,000
17: Parking etc., of conveyances or vessels

Enforcement - 19: Arrest without warrant
20,21: Removal and disposal of abandoned conveyances and vessels

SECTION 5: POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION

5 IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION

5.1 IMPACT IDENTIFICATION & MITIGATION

A development such as the one proposed for Mammee Bay has the potential to create a variety of impacts as it is implemented. These potential impacts can be both 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:

5.1.1 Socio-Economic Impacts

Employment – Direct employment of approximately 1200 tradesmen and labourers during pre-construction and construction phases. Direct employment of approximately 800 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 estimated total investment of about 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.

5.1.2 Environmental Impacts

The following tables provides 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.

5.1.2.1 Pre-Construction/Construction Phases

Potential Impact	Removal of Vegetation, Loss of Habitat
Causing Project Activities	Site Clearance
Environmental Receptor	Land, Flora, Fauna, Endemic Species
Duration	Immediate/Long Term
Magnitude	Medium
Mitigation Measures	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, some of the endemic terrestrial fauna. Species re-introduction should occur naturally in these areas.
Significance	Direct/Minor Negative/Reversible Impact

Potential Impact	Aesthetics
Causing Project Activities	Zinc Fencing Around Project Area
Environmental Receptor	Humans (Residential and Resort Communities)
Duration	Approx. 18 Months
Magnitude	Minor
Mitigation Measures	Maintenance and Upkeep. Construction Monitoring. Communication with Residents/Resorts. Speedy Removal.
Significance	Minor Negative/Indirect/Sporadic/Unavoidable Impact

Potential Impact	Noise, Fugitive Dust, Air Pollution
Causing Project Activities	Vehicular Traffic (Trucks/Heavy Equipment), Soil Stockpiles, Construction Activities
Environmental Receptor	Humans (Residential and Resort Communities)
Duration	Occasional/Specific (Approx. 18 Months)
Magnitude	Medium
Mitigation Measures	Appropriate scheduling of activities. Construction Monitoring. Dust Suppression through sprinkling. Proper Servicing of Equipment. Quick Response. Communication With Residents/Resorts.
Significance	Minor Negative/Indirect/Sporadic/Avoidable Impact

Potential Impact	Storm water, Erosion, Sedimentation, Silting, Run-Off to Sea

Causing Project Activities	Site Clearance, Vegetation Removal, Excavation
Environmental Receptor	Marine/Coastal/Marine Park
Duration	Occasional/Long Term (through occupational phase)
Magnitude	Medium
Mitigation Measures	Careful Phasing of Activities With Consideration of Rainy Seasons. Construction Monitoring. Implementation of Control Devices (Drainage, Silt Fencing, Soak-away, etc.)
Significance	Minor Negative/Indirect/Sporadic/Avoidable Impact

Potential Impact	Flooding Potential, Drainage Patterns, Storm Surge, High Water Table.

Causing Project Activities	Incidental Rainfall, Hurricane, Excavation, Soak Away
Environmental Receptor	Groundwater, Coastal Waters, Project Area
Duration	Occasional/Long Term
Magnitude	Medium
Mitigation Measures	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.
Significance	Minor Negative/Indirect/Occasional/Avoidable Impact

Potential Impact	Sewage and Wastewater (Effluent/Odour)
Causing Project	Sewage Treatment System, Temporary Sewage Handling during

Activities	Construction
Environmental Receptor	Coastal Waters, Groundwater, Human
Duration	Long-Term
Magnitude	Minor
Mitigation Measures	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.
Significance	Minor Negative, indirect, avoidable impact

Potential Impact	Socio-Economic/Cultural/Loss of Traditional Use and Access to beach
Causing Project	Entire Development

Activities	
Environmental Receptor	Human
Duration	Long-Term
Magnitude	Large
Mitigation Measures	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.
Significance	Minor Negative/direct impact

Potential Impact	Solid Waste Handling and Disposal
Causing Project Activities	Vegetation Removal/Construction Activities/Packaging

Environmental Receptor	Coastal Waters, Land, Groundwater, Humans, Aesthetic
Duration	Occasional/Long-Term
Magnitude	Minor
Mitigation Measures	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 a landfill by approved haulers. An approved waste removal service should be contracted to remove waste produced on site.
Significance	Minor negative, direct, avoidable impact

Potential Impact	Construction implements (batching plants, heavy equipment), petrol/oil/lubricant storage
Causing Project Activities	Entire Construction

Environmental Receptor	Soils, Groundwater, Coastal Waters, Air, Humans
Duration	Long-Term
Magnitude	Medium
Mitigation Measures	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.
Significance	Minor negative, direct, sporadic, avoidable impact

5.1.2.2 Operational Phase

Potential Impact	The increase in traffic (buses, cars, staff vehicles etc.) noise levels, gaseous emissions
Causing Project Activities	Operation of Facility

Environmental Receptor	Human
Duration	Occasional over Long-Term
Magnitude	Minor
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.
Significance	Minor negative, direct, occasional, avoidable impact

Potential Impact	Potable Water Supply Shortfall
Causing Project Activities	Operation of development
Environmental Receptor	Human (Community and General Area)

Duration	Unsure
Magnitude	Medium
Mitigation Measures	Work with NWC to develop independent/reliable source for the resort. NWC has committed to providing service. Initiate water conservation and minimization. Utilize treated wastewater for irrigation.
Significance	Minor negative, direct, avoidable impact

Potential Impact	Solid Waste Management
Causing Project Activities	Operation of Resort
Environmental Receptor	Land, Soils, Air, Human, Coastal Waters

Duration	Occasional
Magnitude	Minor
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 landfill.
Significance	Minor indirect, occasional, avoidable impact

SECTION 7: ENVITONMENTAL ACTION/MONITORING PLAN

6 ENVIRONMENTAL ACTION/MONITORING PLAN

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:

6.1 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)

CONSTRUCTION PHASE MONITORING

- 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)

6.2 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)

SECTION 7: ANALYSIS OF ALTERNATIVES

7 ANALYSIS OF ALTERNATIVES

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

Consideration must be given to the fact that this area is zoned for this type of development. The area is basically a resort residential area with an existing resort and a residential community on either side of the proposed development.

7.1 THE NO ACTION ALTERNATIVE

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 condition at present, with the exception of the potential for erosion, which may be a possibility due to planned road construction scheduled for the area in the near term and the fact that no storm water diversion devices are located at the site. 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 caliber will add to the islands ability to market itself to visitors from markets previously under represented through previous marketing activities. If left undeveloped, there is a strong potential for

the site to revert to use by squatters and for the illegal dumping of refuse which only serves to bring down property values and promote a negative image of the area.
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.

7.2 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 Mammee Bay Estate, Greenwich Park and Steer Town. Therefore, community support is anticipated for the development.

The designers have made maximum use of the available property to insure that the development once completed will provide a quality experience for the guests, while maintaining original flora in as many areas as possible. The areas comprising Buildings "A" and "B" will be completely cleared to allow for construction activities, however, from Building "C" through to the southern property boundary, less mature trees will be removed as many are incorporated into the design.

Generally, it is believed that 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 about 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 (800) employees during the operational phase. Site work will be completed on a single shift basis to minimize disturbance to residents and guests in the area. 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.

7.3 THE PROPOSED DEVELOPMENT WITH MODIFICATIONS

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:

- Issues related to the proposed height of the structures (The design has already been modified to meet the existing requirements of the St. Ann Parish Council)
- 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)
- Independent water supply source and impact on the existing supplies in the area (as a condition of purchase, the present owners were guaranteed water supply by the NWC. This service should not interfere with existing service to the residential or other water consumers in the vicinity of the project)
- Established lines of communication with the possibility of a liaison officer between the developers and the community
- Soil stockpile and dust issues
- Aesthetics, particularly the timely removal of zinc fencing surrounding the site and construction of an aesthetically pleasing fence.

All these 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 have publicly resolved to 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.

7.4 THE PROPOSED DEVELOPMENT IN ANOTHER LOCATION

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

Land was zoned for the type of development desired

- Size of available land (34 acres) was desirable
- Land was previously permitted for use as a resort hotel development
- 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
- Issues relevant to solid waste management were easily satisfied due to the development of the area and availability of resources

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 Mammee Bay site identified in the Ocho Rios 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.

APPENDICES

APPENDIX A

APPENDIX A

APPENDIX A-1 REQUEST TO N.W.C. FROM JAMPRO ON BEHALF OF PORT MARLY LTD. FOR THE ASSURANCE OF WATER AVAILABILITY FOR THE RIU OCHO RIOS DEVELOPMENT

05/28/04 11:38 FAX

JAMPRO
www.investjamaica.com

April 10, 2003

JAMPRO OFFICES

Jamaica: Kingston
Head Office,
18 Trafalgar Road
Kingston 10, Jamaica, W.I.
Phone: (876) 978-7754; 978-2337
Fax: (876) 946-0090
E-mail: jampro@investjamaica.com

Jamaica: Montego Bay
Mutual Life Building,
30 Market Street, 2nd Floor,
Main : St. James
Jamaica
Phone: (+876) 952-3420
Fax: (876) 952-1364
E-mail: jamromobay@investjamaica.com

USA: New York
JAMPRO/Jamaica Trade Commission,
Jamaican Consulate General
767 Third Avenue, Suite 221
New York, NY 10017
Phone: (212) 935-9800; 308-5955
Fax: (212) 308-5230
E-mail: jamprony@investjamaica.com

UK: London
1 Prince Consort Road,
London SW7 2BZ, England
Phone: 020-7-584-9994
Fax: 020-7-823-9660
E-mail: jamlondon@investjamaica.com

Canada: Toronto
303 Eglinton Avenue East,
Toronto, Ontario M4P 1J3
Phone: (416) 593-6253
Fax: (416) 963-4821
E-mail: [illegible]@investjamaica.com

Mr. Patrick Fletcher
Regional General Manager
Northern Region
National Water Commission
22-24 Stennett Street
Port Maria
Portland

Dear Mr. Fletcher:

Re: Water for proposed 1000 room hotel for Mammee Bay, St. Ann

I write on behalf of a foreign investor seeking to establish a 1000 room hotel in the Mammee Bay area. The investor is currently negotiating purchase of the land and it is anticipated that the construction of the hotel will take approximately eighteen (18) months.

The investor wishes to be assured of the existence of adequate water supply to construct and operate the resort.

Additionally, they wish to confirm if the National Water Commission's sewerage treatment system can carry the additional capacity load from the proposed development.

I look forward to your urgent response to these two questions to facilitate completion of the negotiations.

Please do not hesitate to contact me for any further clarifications required.

Yours sincerely
Jamaica Promotions Corporation

Veniece Pottinger (Mrs.)
Executive Director - Services

JAMAICA PROMOTIONS CORPORATION

APPENDIX A-2 N.W.C COMMITMENT TO SUPPLYING THE WATER FOR THE RIU OCHO RIOS DEVEOPMENT

05/28/04 11:38 FAX 01

28-48 Barbados Avenue
P.O. Box 65, Kingston 5
Tel: (876) 929-5430-5
Fax: (876) 926-1329

18 Oxford Road
Kingston 5
Tel: (876) 926-5825-7
Fax: (876) 926-7121

4 Mareseaux Road
Kingston 5
Tel: (876) 929-4840-4
Fax: (876) 960-0582

2a Manhattan Road
Kingston 5
Tel: (876) 929-3540
Fax: (876) 968-8247

231A Old Hope Road
Kingston 6
Tel: (876) 977-4998-9
977-5000
Fax: (876) 927-1870

28-30 Church Street
Kingston
Tel: (876) 922-8110-9
Fax: (876) 967-1499

NATIONAL WATER COMMISSION

Water is life

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15 APR 2003

2003 April 11

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To C. Douglas | From V. Pottinger

Co./Dept. [redacted] | Co. JAMPRO

Phone # 929-8824 | Phone # 978-7755

Fax # 929-8823 | Fax # 978-4341

Mrs. Veniece Pottinger
Executive Director - Services
JAMPRO
18 Trafalgar Road
Kingston 10

Dear Mrs. Pottinger:

Re: Water for Proposed 1000-room Hotel for Mammee Bay, St. Ann

I write in response to your letter dated 2003 April 10, regarding the above. The Commission hereby wishes to assure you that we presently have the capability of providing this hotel with an adequate supply of water for its construction and operation.

In addition, we again wish to assure you that we presently have the capacity to treat all sewage generated by this property. However, we must advise that there is presently no conveyance system in place to transport sewage from this property to our Ocho Rios Sewage Treatment Plant.

Please contact this office for any further clarification required.

Yours truly,
NATIONAL WATER COMMISSION

Patrick Fletcher
Regional General Manager – Northern

Copy: President