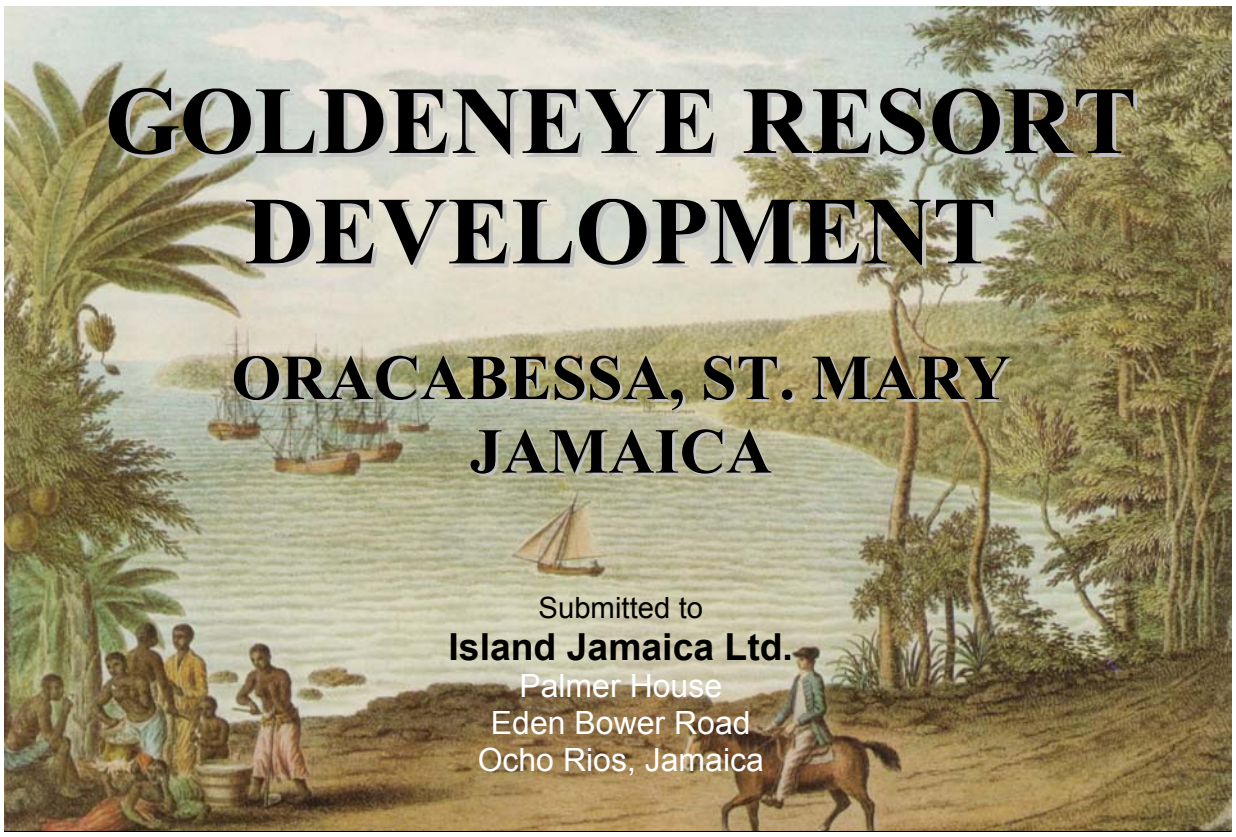
ENVIRONMENTAL IMPACT ASSESSMENT



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EXECUTIVE SUMMARY

OVERVIEW

Island Jamaica Ltd will be undertaking a major resort development to be located on seafront lands it owns located at Oracabessa, St. Mary.

The site comprises the 'old' Goldeneye property, formerly owned by Ian Fleming, well known author of the James Bond books, and 'new' Goldeneye, predominantly lands reclaimed by the government-owned Urban Development Corporation in the mid-1970's.

The overall property is encompassed in several certificates of title, registered in the names of companies controlled by the Island group and Mr. Christopher Blackwell, the project's sponsor.

The development comprises the construction of resort villas, cottages and apartments, all of which will be sold. A resort rental pool operation is to be established and operated by Island Outpost Ltd that will require supporting hotel central facilities.

The development will be undertaken in two phases and involves the construction of approx. 24,000 SM (260,000 SF) of covered building area.

'Old' Goldeneye has 19 residential lots for sale with an average of area of 1,146 SM (12,333 SF). Of these 19 lots, six already have buildings constructed on them and they will be sold without further development. It is intended that the remaining thirteen lots will be sold undeveloped with purchasers being responsible for the construction of residences under the developer's direct supervisory control.

"New' Goldeneye has 55 residential lots for development including an apartment site planned for 30 units. It is proposed that all construction will be carried out by Island Jamaica Ltd.

The resort development is specifically targeted towards the upper-income market. Owners of the cottages and apartments will be required to place their residential units into a rental pool operation to be marketed and managed by Island Outpost Ltd. This will be optional for villa owners.

The rental pool operation requires the construction of hotel-type central facilities including a reception lobby, offices, restaurants and bars, entertainment areas, spa, kitchens & laundry, swimming pools and other back-of-house operations.

All units will be furnished and equipped by the developer.

CONSTRUCTION PROGRAMME

It is proposed to commence the construction of limited infrastructure works by Oct. 2005 necessary to facilitate the commencement of major construction activities by Jan. 2006.

Construction is programmed over 18-months, allowing the hotel to be operational by Aug. 2007.

SITE DESCRIPTION

Overall, the site has an area of 15.2 hectares (37.5 acres) of which 'old' Goldeneye comprises 6.3 hectares (15.5 acres) and 'new' Goldeneye 8.9 hectares (22.0 acres). The two sites are contiguous.

The property is unique in that it has almost 3,000 LM of sea frontage.

The site is gently sloping rising to a maximum height of 13 meters above sea level. 'Old' Goldeneye is heavily wooded whereas 'new' Goldeneye, other than Santa Maria Island, has much sparser vegetation being recent vegetation grown over the last 30 years.

DESCRIPTION OF DEVELOPMENT – 'NEW' GOLDENEYE

Of the 262,000 SF of building construction, 252,000 SF will be carried out on 'new' Goldeneye. The total land area of 'new' Goldeneye is 8.9 hectares or 22.0 acres (958,773 SF) resulting in a plot ratio (covered building area to land area) of 26.1%. The proposed construction works are indicated below at Table 1.

Heavy emphasis will be placed on landscaping. The external elevation of buildings will be 'soft' as they will be mainly of timber construction, or timber siding on reinforced concrete block or natural stone.

Electrical, telephone & cable television infrastructure will be undergrounded. Motor cars will not be allowed access beyond the Clubhouse building at the property's main entrance and access to 'new' Goldeneye will be restricted to golf carts or bicycles. Roads will paved with crushed stone.

Five swimming pools will be constructed - a heated seawater pool in the Thalassotherapy spa, the main pool at Low Cay Beach, a natural seawater pool at the end of the northern peninsular at Low Cay Beach, a pool on Santa Maria Island and a small pool close to Snorkelers Cove.

Table 1. Summary of construction works.

	NO. UNITS	AREA - SF
Residential – Phase 1		
o Villas: 3- & 4-bedroom	10	46,201
o Beach Cottages: 1- & 2-bedroom	12	14,877
o Spa Cottages on Santa Maria Island: 2-bedroom	10	14,957
o Huts at Snorkeler's Cove	10	12,807
o Apartments: 1-, 2- & 3-bedroom units	30	43,400
Total	72	132,242
Residential – Phase 2		
o Villa: 3- & 4-bedroom	12	54,000
Total Residential	***84***	***186,242***
Hotel Central Facilities		
o Main Clubhouse: restaurant, main bar, lobby, offices, entertainment, & main kitchen		16,380
o Thalassotherapy spa		26,120
o Spa Suites (to be built in the lagoon over water)	3	1,185
o Other Restaurants & Bars, Spa facilities, etc.		14,605
o Back-of-House		7,696
Total Central Facilities		***65,986***
Total Building Area 'new' Goldeneye		***252,228***

DESCRIPTION OF DEVELOPMENT – 'OLD' GOLDENEYE

Only 2,050 SF of construction is proposed for 'old' Goldeneye being amenity areas for the residents of 'old' and 'new' Goldeneye. A gym, swimming 'lap' pool and one additional tennis court will be constructed.

As mentioned above, of the 17 residential lots for sale, six already have building constructed on them. The remaining lots will be developed by the individual

purchasers. Presently, 'old' Goldeneye has approx. 19,000 SF of existing buildings.

On completion of all future development, including residential buildings to be constructed by lot purchasers, 'old' Goldeneye will have a plot ratio of not more than 15%.

On a parcel of land, immediately across the north-coast highway from 'old' Goldeneye, it is proposed to erect approx. 8,000 SF of staff housing.

SUMMARY OF ENVIRONMENTAL IMPACTS

The impacts identified and discussed are summarized in the text at Tables 5.5.1 and 5.5.2 (pages 83 & 84).

The negative impacts of significance during the construction phase are:

- loss of land use options,
- damage to corals and other bottom dwelling organisms during repairs of the revetment and construction of the new south-west groyne,
- loss of benthic habitat during the excavation works required to deepen the lagoon,
- sediment disturbance, turbidity, and noise related to the several types of piling activities, and
- inappropriate construction waste disposal.

Given the typically poor standard of environmental management practice on construction sites in Jamaica, particular attention should be paid to the monitoring of the construction works.

The significant negative impacts during the operational phase are:

- waste disposal, both solid and sewage,
- consumption of electricity generated by fossil fuel combustion,
- in-migration and uncontrolled settlement around Oracabessa induced by the project, and
- the misuse of coral reef resources by snorkellers and divers.

All the identified negative impacts can be successfully mitigated.

NEPA ISSUES

The major planning and development issues of concern to NEPA will be:

1. Encroachments and Set-backs from the High Water Mark (HWM):

A number of buildings encroach over the seabed or are located closer than 45 m to the HWM. All structures encroaching over the seabed will be piled or cantilevered from land-based piers as the encroachment is not expected to exceed 4'0". All encroachments are located in the lagoon, which is sheltered and not susceptible to storm surges. The lagoon is used as a 'hurricane hole' for boats during major tropical storms.

The Thalassotherapy spa has a number of balconies and relaxation decks that cantilever or sit on piles over the seabed.

Several buildings are located closer than 45 m to the HWM. The ten beach cottages at Low Cay Beach are set-back approx. 12 m from the HWM. However, it must be noted that the owner created this beach by 'dredging back' the formerly reclaimed land area to create Low Cay Beach. Snorkelers Cove beach was created in a similar manner.

2. Construction over the Seabed:
   Three spa suites are to be constructed in the lagoon and will be of timber construction. They are each approx. 275 SF in area and will be connected to land by timber walkways. All bathrooms will be located on land.

3. Docks & Decks over the Seabed:
   Twenty-three of the residential lots facing the lagoon will have piled decks encroaching over the seabed from their seafront boundaries. The decks will average 80 SF in area. Ten of these villa lots also have small building encroachments mentioned at 1. above.

   Boardwalks, elevated approx. 2'0" above sea level, will be constructed along the sea wall over the lagoon. They will approximate 6'0" in width. They are located from the Santa Maria Island bridge north of the Clubhouse along the lagoon to the Spa and to the east of Low Cay Beach.

   Four large T-shaped boat docks are proposed, all located in Oracabessa Bay. Two of the docks will be private, attached to five residential villa lots (nos. 31 to 35).

   A dock will be located opposite the main Clubhouse building available to members of the boating public wishing to use the hotel's amenities. Another will be located approx. 40 m to the north, being an extension of an existing stone jetty, and will serve the main water-sports area.

4. Reclamation:
   Permission is being sought to reclaim two small areas. One is opposite the main Clubhouse building and will require sheet piling to straighten the

irregularly-shaped coastline. This involves an area of reclamation of approx. 132 m^2.

The other is a groyne at the south-west headland of the Outer Banks and will form an attractive promontory to the entrance of Oracabessa Bay.

5. De-silting the Lagoon:
   The north-west quadrant of the lagoon, with an area of approx. 1,200 m^2 silted-up before the lagoon was opened into Oracabessa Bay. At present, the seabed in this quadrant is very shallow at approx. 18" and filled with unpleasant muddy silt.
   It is proposed to remove the silt to allow a comfortable swimming depth of 3'6". The silt will be placed in landscaped areas on the Outer Banks.

6. Bridge across the Lagoon:
   A bridge connecting Santa Maria Island to the 'causeway' leading to the Outer Banks is required. The bridge will be 24 m in length and 4 m wide and spans the lagoon. Other than emergency vehicles, its use will be restricted to golf carts and pedestrians.

7. Sewage Treatment Plant:
   All sewage will be collected and pumped by force main to a sewage treatment plant located on lands owned by Island Jamaica Ltd to the west of Goldeneye. The type of plant proposed is an oxidation ditch with concrete retention tanks. The grey water effluent will meet NEPA standards and will be pumped back to the Goldeneye development for landscaping irrigation.

   'Old' Goldeneye will also be connected to the new treatment plant, abandoning their existing plant.

8. Storm Water Collection & Disposal:
   Storm water will be collected and de-silted before disposal. Wherever possible, storm water will be channeled in grass swales to assist in its cleansing.

9. Seawater Swimming Pool:
   A seawater swimming pool is proposed at the end of the northwest promontory by Low Cay Beach. It will be located on lands already registered in the name of the owner but will be constructed by removing a section of the promontory and constructing the pool supported on piles and columns in the exposed seabed.

10. Thalassotherapy Spa:
    The Thalassotherapy spa provides a number of treatments requiring the use of untreated seawater. All products used in the spa will be seawater based. A heated seawater swimming pool will be a major feature. Chemical treatment of the pool using chlorine cannot be considered requiring the pool water to be completely exchanged over a four-day period.

    All seawater used in the pool and for treatments is cooled in settling tanks to ambient temperature before being subjected to UV treatment and pumped back to sea.

11. Fishermen's Beach
    Island Jamaica Ltd is in the process of licensing a parcel of beachfront land to local fishermen. All fishing boats will use this beach, which is located immediately adjacent to the resort's main entrance. Under proper management and control, it is hoped to incorporate the fishermen into the ambience and essence of the development.

12. Parking
    55 parking spaces will be provided immediately opposite the main entrance, principally for day visitors to the hotel and spa and for some staff. 124 parking spaces will be provided on 'old' Goldeneye for owners and visitors.

RESTRICTED USE OF LAGOON

An essential component of the Goldeneye experience is swimming in the lagoon around Santa Maria Island. The Thalassotherapy spa is located to the south and on the edge of the lagoon and, as with most spas, a peaceful and relaxing environment is essential to its operation. At present the lagoon is used by a few fishermen and pleasure 'party' boats, activities which are inimical to the uses planned by the proposed Goldeneye development.

An application has been made to the National Land Agency for Island Jamaica Ltd to lease the lagoon from government for extensive use by swimmers and to prevent its use by motorized boats. There are several advantages to this including the protection of a marine sanctuary and enhancement of security and safety for guests.

PLANNING RATIOS

'New' Goldeneye, on completion of all construction, will have a plot ratio (building area as a ratio to land area) of 26.1%. The footprint or land cover ratio (footprints of buildings as a ratio to land area) is 18.5%.

'Old' Goldeneye presently has a plot ratio of less than 3%. On completion of all development, it is not anticipated to have a plot ratio exceeding 15%.

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1. INTRODUCTION

1.1 PURPOSE

Island Jamaica Limited (IJL) has prepared plans for the development of waterfront lands adjacent to the Goldeneye property in Oracabessa, St. Mary. This is intended to be an up-market villa, cottage and apartment resort complementary to the existing activities at Goldeneye with resort facilities including spa, restaurants and supporting back-of-house. Environmental Solutions Limited (ESL) was commissioned to conduct the environmental impact assessment (EIA) of the proposed development to meet the requirements of the statutory planning agency, the National Environment & Planning Agency (NEPA), and to provide the appropriate environmental guidelines for the development of the project.

1.2 BACKGROUND

The proposed development site is located on a part of 28 hectares (70 acres) of coastal land in Oracabessa, St. Mary. Oracabessa is situated 13 kilometers (8 miles) west of Port Maria on the main road to Ocho Rios (Figure 1.1).

In the mid-seventies the Urban Development Corporation (UDC) proposed a development for Oracabessa that involved the expansion of the town as a banana port. Landfill operations created two bays with a boat channel and extended the land seaward to the reef. However the development did not continue beyond the basic land reclamation. Then, in 1993, Island Trading Company acquired the option on the 28 ha of reclaimed land from the Urban Development Corporation. A series of plans were developed which called for the seamless extension of the town of Oracabessa to the waterfront in a manner that would create a truly integrated resort development. Those plans were modified over the subsequent years and IJL now intends to create on a part of this land a high-end tourist resort that is environmentally friendly and which will contribute to the economic development of the area.

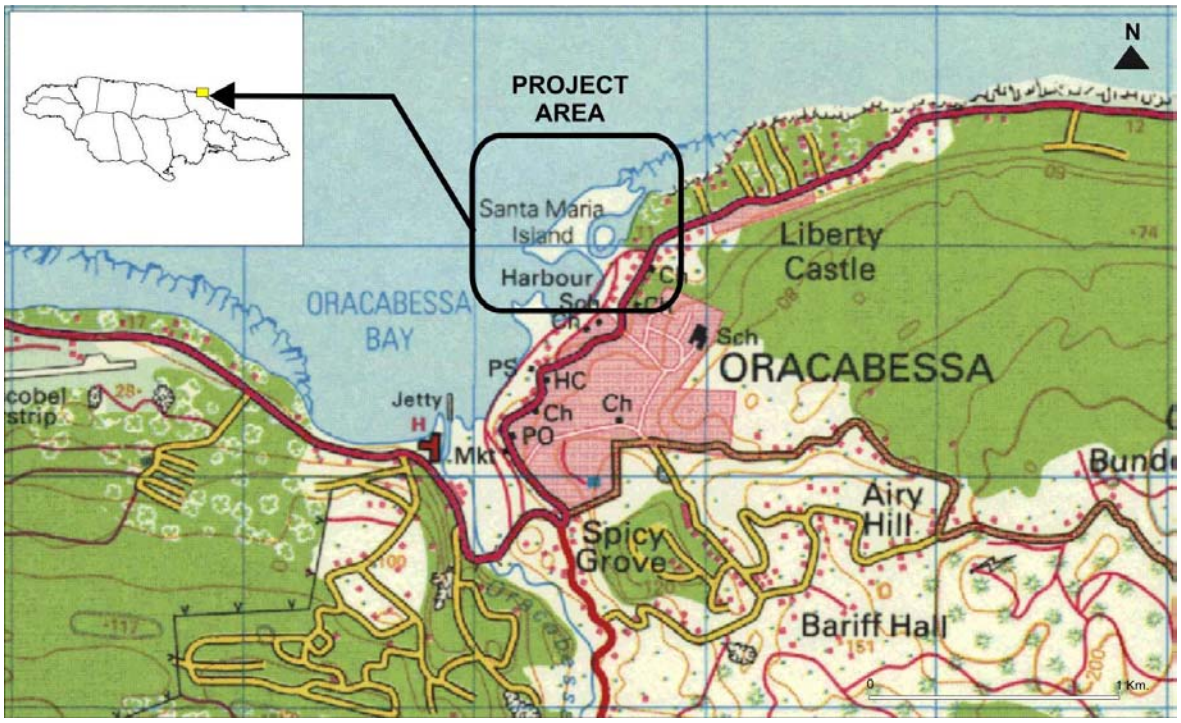

Figure 1.1 Location of development site

The overall site consists mostly of built-up land in the east and a flood plain in the west. Figure 1.2 (inserted at back cover) shows the layout of the proposed development and Figure 1.3 shows the land area owned by IJL and the location of the sewage treatment plant in relation to the development site.

The main elements of the development site are:

- ◊ **'Old' Goldeneye:** 6.3 hectares (15.5 acres) of elevated land overlooking the sea and the site of the house built by the author, Ian Flemming.
- ◊ **Headland (a.k.a. 'Outer Bank'):** approximately 6 hectares (15 acres) of rectangularly shaped flat low-lying land (4 – 10 ft asl), reclaimed from the sea, linked by a short causeway to the mainland.
- ◊ **Santa Maria Island**: a small island still in its natural condition.
- ◊ **Lagoon (a.k.a. Boat Channel)**: a body of shallow water surrounding Santa Maria Island and protected by the headland. It is connected by a channel to the sea at its

Figure 1.3 Drawing of Oracabessa showing area owned by IJL.

◊ eastern end and to Oracabessa Bay via culverts located under the mainland/headland causeway.

◊ **Oracabessa Bay**: An inner harbour and beach with a narrow coastal strip ending at the headland. A small fishing beach is located here.

◊ **Mainland**: comprises of a waterfront promenade (including James Bond Beach), which ends in a public beach at the estuary of the Jacks River.

◊ **Silvera Lands**: Two lots of land opposite to the resort entrance on which will be located the back-of-house facilities and a parking lot.

◊ **Staff housing**: A lot opposite to the entrance to 'old' Goldeneye on which housing and parking for staff will be provided.

The concept of the development is to create a resort within the town of Oracabessa that incorporates its natural beauty, the climate, the architecture and the people. A primary goal of the waterfront development is to revitalize the economy of the town by attracting visitors to the area, and secondarily to re-energize the traditional architecture of Jamaica. This in part fulfills the intention of the original plan (UDC Report) for the harbour with the exclusion of the major port activity.

1.3 PROJECT OVERVIEW

- Island Jamaica Ltd will be undertaking a major resort development to be located on seafront lands it owns located in Oracabessa, St. Mary.

- The site comprises the 'old' Goldeneye property, formerly owned by Ian Fleming, well-known author of the James Bond books, and 'new' Goldeneye, predominantly lands reclaimed by the government-owned Urban Development Corporation in the mid-1970's.

- The overall property is encompassed in several certificates of title, registered in the names of companies controlled by the Island group and Mr. Christopher Blackwell, the project's sponsor.

- The development comprises the construction of resort villas, cottages and apartments, all of which will be sold. A resort rental pool operation is to be established and operated by Island Outpost Ltd requiring supporting hotel central facilities.

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- The rental pool operation requires the construction of hotel-type central facilities including a reception lobby, offices, restaurants and bars, entertainment areas, spa, kitchens & laundry, swimming pools and other back-of-house operations.

- All units will be furnished and equipped by the developer.

1.4 ENVIRONMENTAL IMPACT ASSESSMENT

1.4.1 Purpose

The environmental impact assessment (EIA) seeks to identify, in a structured and systematic manner, the possible consequences, positive or negative, of the proposed project on the environment. Appropriate mitigation measures can then be identified that will avoid or reduce any adverse impacts to acceptable levels. EIA is a tool that helps to achieve sustainable development. The Terms of Reference for the EIA of the Goldeneye development are shown at Appendix 1.

1.4.2 Study Area

The area over which the project may exert some level of influence or that which may affect the project includes, for the purpose of this EIA, the actual project development site, the watershed & surface drainage affecting that site, the adjacent fringing reef and inshore waters, the town of Oracabessa and its communities, and the communities providing significant numbers of project labour and resort employees, and the quarries from which project earth materials will be obtained.

1.4.3 Study Team

The multidisciplinary skills required to conduct the EIA were assembled from expertise at and available to ESL. The core team was made up of the following persons:

- ◊ Peter Reeson, M.Sc. - Principal Consultant; EIA Specialist and Ecologist
- ◊ George Campbell, M.A. – Socioeconomist
- ◊ Sharonmae Shirley, M.Phil. - Environmental Chemist
- ◊ Aedan Earle, M.Sc. – Geologist
- ◊ Andrea Lanigan, M.Phil. – Marine Biologist

1.4.4 Methodology

The fieldwork and data collection for this study were carried out during visits to the site, mainly between June and July 2004. Field investigations included primary and secondary disturbances, fauna and flora identification, marine water quality analysis, surveys of the marine communities as well as a socio-economic survey of the local population. The

methods employed to conduct the study are described below. The assessment also included a review of the data collected and an environmental impact assessment prepared on behalf of the Client in 1996 (Environmental Solutions Ltd., 1996).

a. Terrestrial ecology survey

The land vegetation on the headland was described from observations made while visiting the site on foot. No attempt was made to obtain quantified data since the vegetation is not a natural assemblage, being comprised of opportunistic and planted species. Identification of the trees on Santa Maria Island was made by observations from the opposite shoreline.

b. Marine habitat survey

Three sites along the coast of Oracabessa, St. Mary were investigated to determine the status of the marine communities that exist there, and to evaluate the vulnerability of the ecosystem to any impacts caused by the development of the Goldeneye property. The investigation was carried out primarily by snorkeling, and supplemented by SCUBA diving. The three sites studied, shown at Figure 1.4, are:

- ◊ The lagoon surrounding Santa Maria Island
- ◊ The stretch of coral reef north of the headland
- ◊ Oracabessa Bay.

A qualitative assessment of each site was conducted to provide a species list and an abundance (DAFOR) rating for each species. The DAFOR is a subjective rating which provides an indication of whether an organism is Dominant, Abundant, Frequent, Occasional or Rare in the environment.

Quantitative data on coral cover and size were collected along 10 m long transects. Data on macroalgal cover and coral recruit densities were collected using 0.25 cm^2 quadrats. Quadrats measure algal percent cover in small areas without large coral heads, so the data obtained often show greater percent cover values than are representative of the site, particularly when coral cover is high. As such, more representative estimated values of algal cover for the entire site are provided in some cases, which take into account cover of

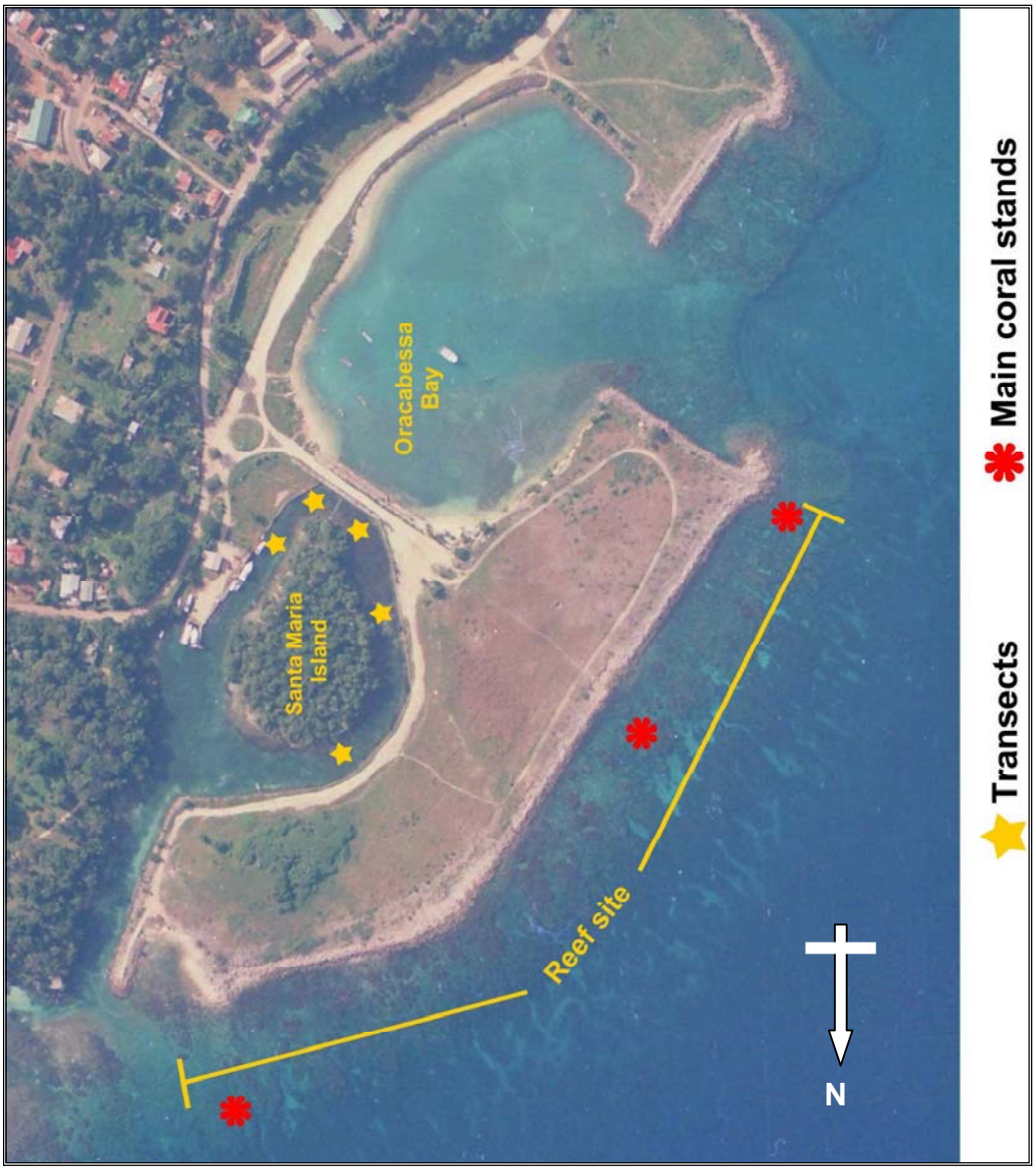

Figure 1.4 Location of marine study sites.

coral and other benthic invertebrates. The quadrat data are more valuable in determining proportions of different algal types in the area, rather than overall percent cover.

c. Socio-economic survey

Rapid rural appraisal techniques were used in nine communities within or around Oracabessa, to identify impacts of relevance to the project. The process involved windscreen observations, in-depth structured interviews, as well as non-structured *ad hoc* discussions with individuals and groups. Both government agencies and private sector enterprises were canvassed. Demographic data was sourced from STATIN and hydrological data from the Water Resources Authority.

Figure 1.5 Map showing location of marine water quality sample stations.

d. Water quality survey

Surface (-0.5m) marine water quality samples were collected at three stations on 10 August 2004. The locations of the sampling stations are shown on Figure 1.5 and the results are discussed at Section 2.8. The samples were stored on ice after collection and taken to laboratories in Kingston for analysis.

A YSI Model 33 SCT meter was used for measuring temperature and salinity. Water samples for total suspended solids were collected in clean plastic bottles and later filter dried to constant weight at the lab. Nutrient samples were collected in 2 litre plastic bottles; marine nitrates were measured using flame photometry and phosphates were measured using UV spectrophotometry at the UWI Centre for Nuclear Sciences. Coliform samples were collected in sterile bottles and analysed at the Jamaica Bureau of Standards.

2. PROJECT ENVIRONMENT

The development site is a portion of the 70 acres of reclaimed coastal land that occupies the entire coastal exposure of the central area of the town of Oracabessa. The physical environment has been comprehensively studied in earlier master plans (UDC, Architects, Engineering). The following sections serve to highlight the most important features by combining past reports with present field investigations.

Overall, the development site has an area of 15.2 hectares (37.5 acres) of which 'old' Goldeneye comprises 6.3 hectares (15.5 acres) and 'new' Goldeneye 8.9 hectares (22.0 acres). The two sites are contiguous.

The site is gently sloping rising to a maximum height of 13 meters above sea level. 'Old' Goldeneye is heavily wooded whereas 'new' Goldeneye, other than Santa Maria Island, has much sparser vegetation being recent vegetation grown over the last 30 years. The property is unique in that it has almost 3,000 LM of sea frontage.

2.1 CLIMATE

Climatic conditions are relatively constant throughout the year. Average monthly rainfall for Oracabessa shows distinct peaks in the months of May and October (Oracabessa Development - Engineering Master Plan, 1994). The Jacks River area averaged 178 mm (7.02 inches) per month for the period 1951 - 1990, indicating moist to dry conditions.

Winds predominate from the East/Eastnortheast, although winds from the east should be less tempestuous, as Oracabessa Bay is sheltered from this direction. Wind directions may shift to the North and Northwest between the months of November and February.

Abnormally high winds are experienced when hurricanes pass over or close to the island. These storms are an annual threat between June and November.

2.2 TOPOGRAPHY AND GEOLOGY

The site is located geologically within an area classified as Coastal Group. This consists of white and bluff coloured marl, limestone and sandy limestones, poorly consolidated sands, gravel and coral reefs. They overlie the white limestone formations uplifted during the middle Miocene period to form a series of raised reef terraces. The soil of the area is soft, brown, silty clay overlying creamy white limestone closer to the sea. River alluvial also occurs.

The proposed development site lies on a flat area on the coast at sea level. This area rises gradually into steeply sloping limestone hills to the south. For the most part the development site is comprised of reclaimed land that was built up with marl taken from local limestone quarries.

2.3 HYDROLOGY AND DRAINAGE

Drainage of the site area is fairly rapid. Rainwater percolates downwards through surface fissures, sinkholes and conduits into the groundwater system. Surface runoff occurs primarily through the major drainage channels of the town gully and the Jacks River. The terrestrial groundwater system interfaces with coastal seawater, particularly in the bay. GIven the coastal and reclaimed nature of the site, ground water is not considered to be of any consequence.

2.4 HAZARD VULNERABILITY

2.4.1 Hurricanes and Storms

Approximately 14% of hurricanes and tropical storms between 1880 and 1980 passed within less than 161 kilometres (100 miles) from Oracabessa. The mean number of occurrences per year was 0.384 and the recurrence interval was 5.5 years. Hurricanes generally occur during the months of August and September, most approaching Jamaica from the east.

Hurricane Allen passed within 32 km (20 miles) of the north coast in August 1980, and clocked winds of 115 knots. Storm surges of over 3 m were recorded at Oracabessa, but this is the only documented case in the area. However the propensity for flooding exists particularly to the west of the development site, in the vicinity of Jacks River. Hurricanes Gilbert (1988) and Ivan (2004) did not cause much coastal marine damage owing to their tracks being south of the area. Hurricane Dennis (Category 2, July 2005) passed about 40 km north of Oracabessa without inflicting very much coastal damage.

2.4.2 Earthquake

Damaging earthquakes with Intensity VI (MM) occur in the Oracabessa area with a frequency of approximately 6-7 per century. Numerous earthquake epicenters were recorded offshore between August 1978 and December 1980. These are associated with the seismicity of the Cayman trough, which runs between Jamaica and Cuba.

2.4.3 Tsunami

Jamaica has a history of tsunamis, probably the most well-known being that which affected Port Royal in 1692. In terms of the vulnerability of the site to such events, it should be noted that the headland, with a height along the northerly face of >3m, offers considerable protection to the development site.

2.4.4 Fire

Oracabessa does not have its own fire brigade service but falls within the divisional responsibility of Port Maria. St. Mary has three fire trucks operating out of two stations; one at Port Maria and two at Annotto Bay. According to an opinion expressed at the parish divisional level, Oracabessa can be adequately serviced from Port Maria, since it is within a ten-minute response time. If necessary, support can be brought in from Ocho Rios, which has three units. Oracabessa has active fire hydrants, and a condition of the fire services approval of the project will be that the project must install a stipulated number of fire hydrants.

2.5 TERRESTRIAL ENVIRONMENT

The headland (Outer Bank), comprised entirely of marl fill, is covered by mix of open dry coastal vegetation and grasses tolerant of salt laden winds. The trees include coconut (Cocos nucifera), sea grape (*Coccoloba uvifera*), dogwood (*Piscidia piscipula*), seaside mahoe (*Thespesia populnea*), poui (*Tabebuia sp*.), and black mangrove (*Avicennia germinans*).

A small natural island surrounded by a boat channel (Santa Maria Island) is present in the eastern section of the project area. The terrain is dry, and the vegetation is typical of that found in coastal limestone forests. No unusual, rare or endangered species were noted, and the vegetation is typical of relatively undisturbed coastal woodland found on the mainland. Dominant species include coconut, red birch (*Bursera simaruba*) and, along the edges, red mangrove (*Rhizophora mangle*).

The mainland part of the project site is composed mostly of reclaimed land. The vegetation is sparse and the species typical of the dry coastal environment, e.g. white mangrove (*Laguncularia racemosa*).), button mangrove (*Conocarpus erectus*), sea grape, *Lantana sp.* and seaside mahoe, are present, particularly along the eastern and south-eastern edges. Other species on the site consist primarily of pasture and scrub vegetation, such as *Ipomea sp*. and other herbs and grasses.

In the flood plain on the western side of the Oracabessa development, the area proposed for locating the sewage treatment plant, the vegetation is consistent with that found in dry to occasionally brackish environments. Species include guango (*Samanea saman*), almond (*Terminalia catappa*) and black mangrove. Small sedges, grasses such as climbing bamboo (*Chusquea abietifolia*), common bamboo (*Bambusa vulgaris*) and wild cane (*Gynerium sagittatum*) also occur in the area. Charcoal burning takes place in this area.

Beyond the limits of the present project area, along the cliff edge of the Oracabessa development, which has a moister environment than that found along the promontory,

large shade trees occur. Species include dogwood, guango, red birch, red cordia (*Cordia sebestena*) and fruit trees such as mango, breadfruit, almond and papaya. Various species of climbers are also present on the cliff wall. (A survey of the major trees on the site has been detailed in three vegetation maps, prepared by the developer in the mid 1990s. A list of the major species found at the development site is given in Table 2.1).

Table 2.1 List of major plant species at the development site.

Scientific name	Common name
Allamanda cathardica	Allamanda
Bougainvillea glabra	Bougainvillea
Ixora macrothyrsa	Ixora
Rhizophora mangle	Red mangrove
Laguncularia racemosa	White mangrove
Conocarpus erectus	Button mangrove
Avicennia germinans	Black mangrove
Coccoloba uvifera	Sea grape
Cocos nucifera	Coconut
Samanea saman	Guango
Terminalia catappa	Almond
Chusquea abietifolia	Climbing bamboo
Bambusa vulgaris	Common bamboo
Gynerium sagitatum	Wild cane
Piscidia piscipula	Dogwood
Bursera simarouba	Red birch
Cordia sebestena	Red or Scarlet Cordia
Spathelia sorbifolia	Mountain Pride
Tillandsia recurvata	Old Man's Beard
Gossypium barbadense	Sea Island Cotton
Lantana sp.	
Ipomea sp.	
	Bromeliads
	Mango
	Breadfruit
	Papaya

2.6 TERRESTRIAL FAUNA

Table 2.2 lists the terrestrial and coastal bird species recorded from the Oracabessa area. Three of the species identified (Jamaica Euphonia, Jamaican Woodpecker and Red-billed Streamertail Hummingbird) are endemic to Jamaica.

The species were observed on both the mainland and the island, indicating that it is unlikely that there is any difference between the avifauna of the two areas. Other terrestrial species seen included lizards of the genus *Anolis*, five species of butterflies (including those of the genus *Papilio*) and several species of ants. Signs of crabs of the

Table 2.2 List of the Oracabessa avifauna and butterflies.

Land birds	Coastal birds	Butterflies
Smooth-billed Ani	Frigatebird	*Papilio androgenus*
Gray Kingbird	Great Egret	*Papilo thoas nealces*
Greater Antillean Grackle	Great Blue Heron	*Phoebis trite*
Jamaica Euphonia	Green-backed Heron	*Eurema leuce*
Jamaican Woodpecker	Yellow-crowned Night Heron	*Haematera pyramus rubra*
Bannaquit	Little Blue Heron	
Cattle Egret		
Cave Swallow		
Red-billed Streamertail Hummingbird		
Common Ground Dove		

genus *Cardisoma* were also abundant in the area. The terrestrial fauna is not, however, unusual or peculiar to the area.

2.7 MARINE ECOLOGY

2.7.1 Lagoon

The lagoon surrounds Santa Maria Island and is contiguous with the ocean via the boat channel to the northeast and with Oracabessa Bay via a culvert to the southwest. It is a shallow lagoon with depths ranging from approximately 0.8 to 4 m. The deeper parts of the lagoon (> 3 m) occur on the eastern side, closer to the boat channel.

The findings of the coastal engineering study (Coastal Systems International, 2004) determined that the existing dimensions of the culvert under the land bridge (causeway) separating the canal from Oracabessa Bay were sufficient to provide adequate tidal flow to maintain satisfactory water quality conditions in the lagoon (Plate 2.1). The study determined that the flushing time (time taken for volume of water in the lagoon to be completely replaced) was 3 days, better than the four days that would normally be

recommended. A bridge is to be constructed to replace the culvert and the resultant opening will considerably improve flushing rates.

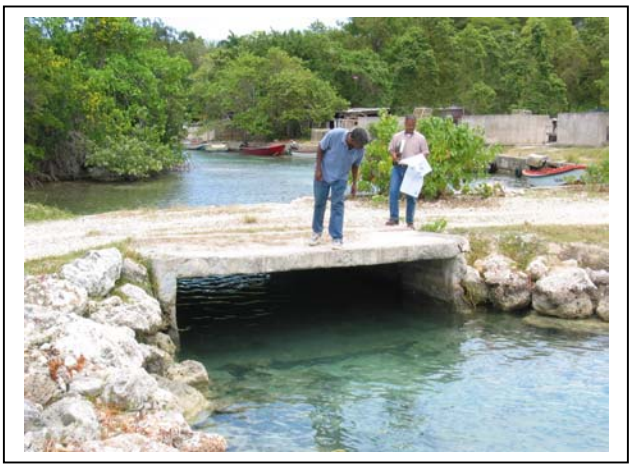

Plate 2.1 Culvert at causeway between mainland and headland at Oracabessa Bay.

The substrate is mainly covered by seagrass and algae, with some patches of bare sand. The sediment is of two types: coarse sand made up almost entirely of *Halimeda* fragments, and fine-grained buff-coloured sand (Figure 2.1). The latter is mixed with very fine-grained grey silty sediment, which creates high turbidity when disturbed. In areas where the coarse sand is present, it is only about 5 cm deep, with the fine sandy (& silt-like) type underlying it. The inner margins of the lagoon surrounding the island are generally shallower than the outer margins of the lagoon, and are mainly bare and sandy. Red mangrove prop roots are found in this area, extending into the water from the island (Plate 2.2). The distribution of sediment cover types is shown at Figure 2.2.

The water within the lagoon varies in temperature at different locations. The water by the culvert and on the southern side of the lagoon was very warm, while on the northern and eastern side near the boat channel, it was quite cool, due to the influx of water from the sea. In the afternoon hours when the ocean became rougher, the lagoon became very turbid, with low visibility.

Seagrass beds (*Thalassia testudinum*) are present all around the lagoon, occurring in thick pockets in some areas (Plate 2.3), and in others intermingled with algae and areas of bare sand. Seagrass occupies approximately 29% of the lagoon substrate (Table 2.3).

Figure 2.1 Distribution of sediment types in lagoon around Santa maria Island.

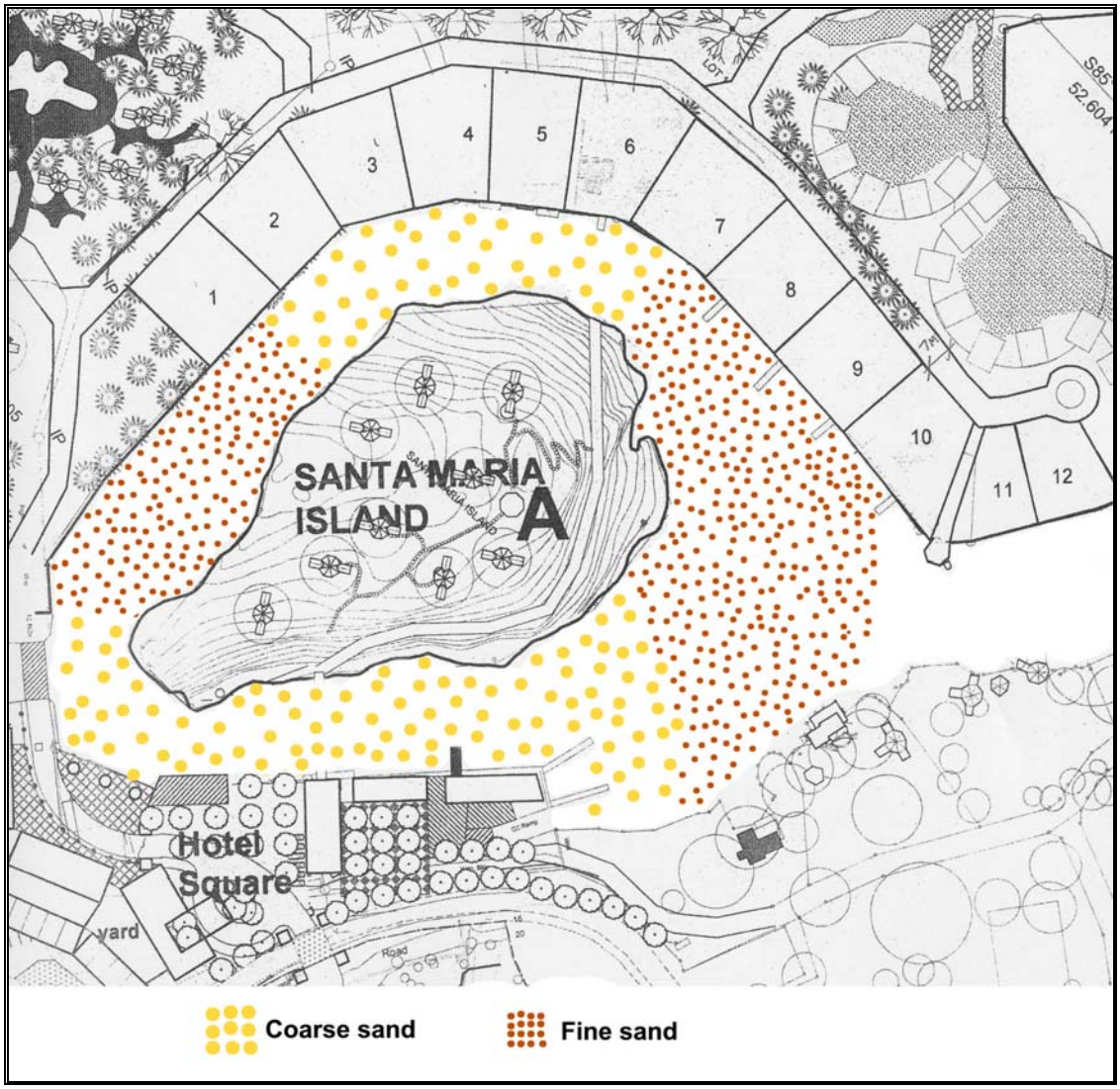

Plate 2.2 *Rhizophora mangle* roots which provide a sanctuary for juvenile fish.

Plate 2.3 Dense seagrass bed with numerous fish swimming above it.

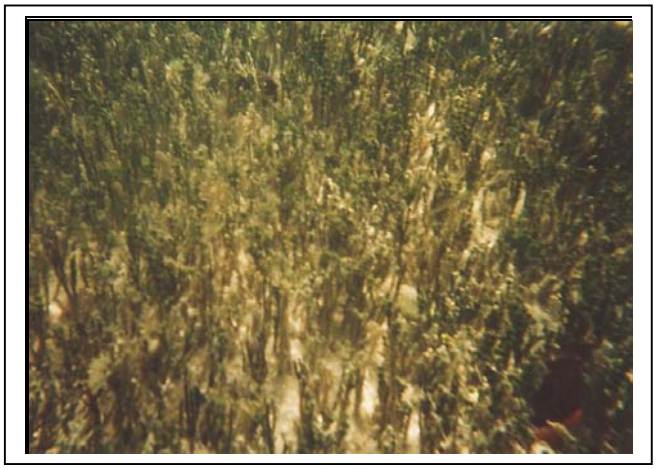

Plate 2.4 Dense algal bed composed almost entirely of *Halimeda tuna.*

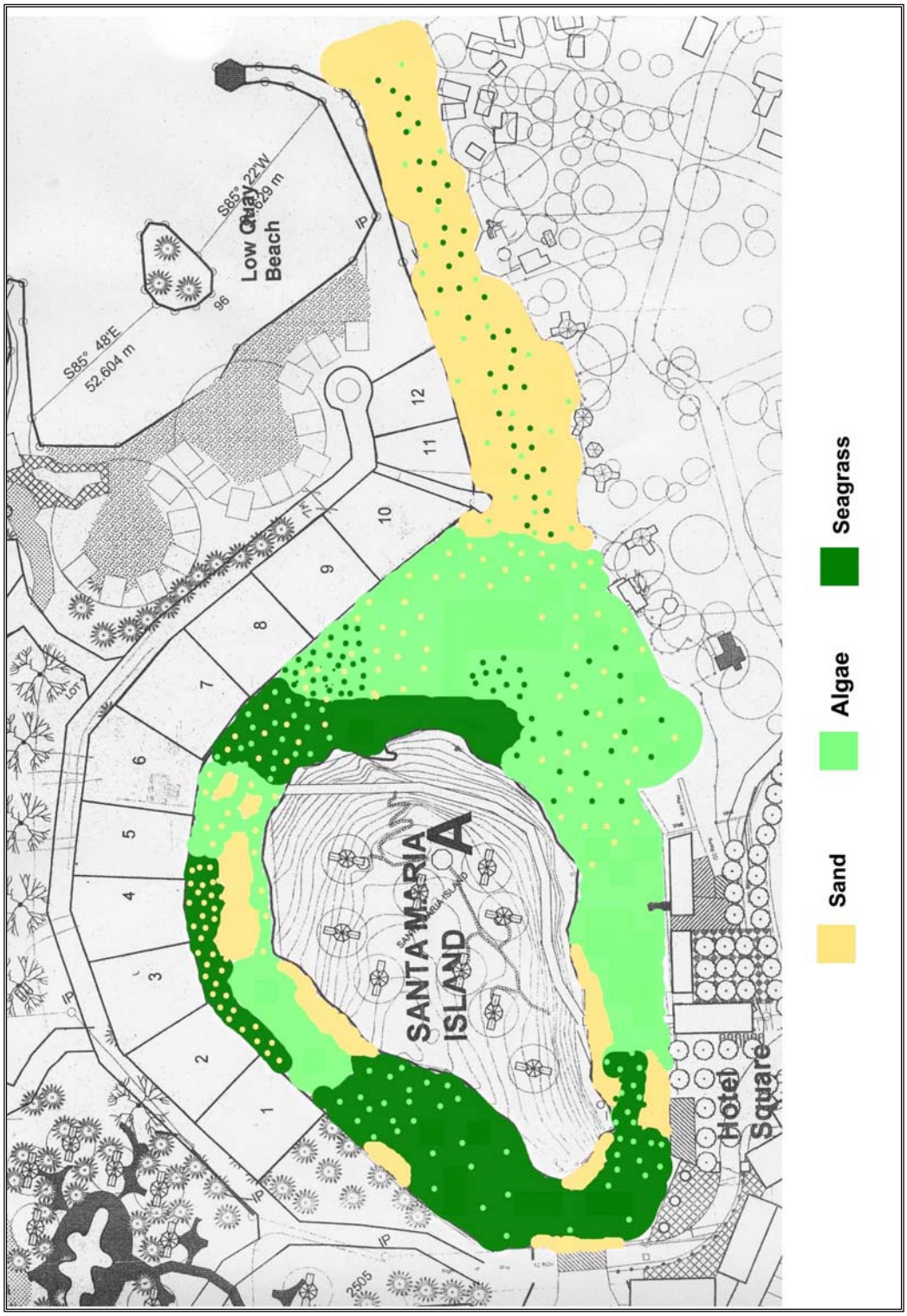

Figure 2.2 Diagram showing distribution of benthic types in the lagoon.

The *Thalassia* blades were generally quite long, averaging 25 cm with some exceeding 30 cm. They had very little epibiota, or encrusting organisms on the blades, but did have quite a bit of sediment deposited on them. Colonial flat tunicates and hydroids are present on some blades. High epibiont cover on the blades is often indicative of high nutrient levels in the water, so the paucity of encrustation suggests that the lagoon does not experience high nutrient loading. The low level of water movement may facilitate the growth of very long seagrass blades, as the plants are able to put more resources into shoot growth rather than root growth, as there is no difficulty anchoring themselves in the calm lagoon. It was noted that the longest seagrass blades occurred on the southwestern side of the lagoon, coinciding with an area of very warm water, presumably indicative of poor water circulation.

Table 2.3 Percent cover of benthic types in the lagoon (transect data).

Transect	Location	% Cover		
		Seagrass	Algae	Sand
1	Southeast	-	100	-
2	South	30	45	25
3	Southwest	75	11	14
4	West	40	60	-
5	Northwest	-	76	24
Average		29	58	13

The other floral component dominating the substrate are green algae. *Halimeda opuntia* and *Halimeda tuna* (Plate 2.4) are the dominant species, blanketing large areas in virtually pure stands. These calcareous algae are the main contributors to the coarse sand in the lagoon. The large pockets of *Halimeda sp.* and other algae were often coated with a layer of fine sediment. The algae were generally less than 10 cm in height, except for *Halimeda opuntia* , which was approximately 6 cm tall. Brown algae, predominantly *Dictyota sp.*, were seen in patches on the western side of the lagoon, and were very sparse in the other areas. The transect data (see Table 2.3) indicates that approximately 58% of the substrate is covered by algae. The majority of this is green algae, with brown algae contributing less than 6% (Table 2.4).

Table 2.4 Percent cover of benthic types in the lagoon (quadrat data).

Transect	Quadrat	% Cover			
		Seagrass	Green algae	Brown algae	Sand
2	1	30	57	3	10
3	2	20	65	-	15
3	3	80	-	-	20
3	4	40	5	-	55
4	5	5	10	-	85
4	6	1	99	-	-
4	7	10	80	-	10
5	8	-	65	35	-
5	9	-	20	20	60
Average		21	45	6	23

The lagoon fauna (Table 2.5) is typical of that found associated with sea grass beds. Urchins and sea cucumbers are common throughout the area, as are fireworms and lugworms. Upsidedown jellyfish are abundant on the western side of the lagoon, and rarely found elsewhere at the site. Forty-one animal species were identified in the lagoon, 17 of which were classified as dominant, abundant, or frequent in occurrence.

The fish community is composed mainly of juveniles, with mature fish occasionally seen. Of the 25 species of fish identified in the lagoon, 8 were found only as juveniles. The other species were seen in both juvenile and adult forms, with juveniles being more abundant. At least 4 species of juvenile fish were present in very large schools, which were found mainly in the southern region of the lagoon. These fish varied in size from 2 to 5 cm long. One of the species was identified as juvenile red-ear herring, and another may have been silversides. The other two species were not positively identified. The fish are silvery with coloured stripes, and are not typical reef fish. They are possibly commercially important fish, which mature inshore in nursery habitats such as sea grass beds and mangrove lagoons, and later migrate, spending their adult life outside the reefs in the open ocean. The fish making up these schools numbered in the thousands.

Table 2.5 Species list of organisms found in the lagoon surrounding Santa Maria Island.

Common name	Scientific name	DAFOR
Fishes:		**26 species**
Foureye butterflyfish*	*Chaetodon capistratus*	R
Blue tang	*Acanthurus coeruleus*	F
Doctorfish	*Acanthurus chirurgus*	O
Bar jack*	*Caranx ruber*	O
Irish pompano*	*Diapterus auratus*	O
Great barracuda*	*Sphyraena barracuda*	F
French grunt	*Haemulon flavolineatum*	O
Margate	*Haemulon album*	R
Yellowtail snapper	*Ocyurus chrysurus*	O
Schoolmaster*	*Lutjanus apodus*	O
Red-ear herring*	*Harengula humeralis*	A
Dusky damselfish	*Stegastes adustus*	O
Cocoa damselfish	*Stegastes variabilis*	F
Beaugregory	*Stegastes leucostictus*	O
Sergeant major	*Abudefduf saxatilis*	O
Blue chromis	*Chromis cyanea*	O
Indigo hamlet	*Hypoplectrus indigo*	O
Harlequin bass*	*Serranus tigrinus*	O
Fairy basslet	*Gramma loreto*	F
Stoplight parrotfish*	*Sparisoma viride*	F
Princess parrotfish	*Scarus taeniopterus*	O
Yellowhead wrasse	*Halichoeres garnoti*	F
Cardinalfish	*Apogon sp.*	O
Sand diver	*Synodus intermedius*	R
Balloonfish	*Diodon holocanthus*	O
Unidentified schooling juveniles		D
Echinoderms:		**6 species**
Long-spined urchin	*Diadema antillarum*	O
Variegated urchin	*Lytechinus variegates*	F
Slate-pencil urchin	*Eucidaris tribuloides*	O
Three-rowed sea cucumber	*Isostichopus badionotus*	F
Donkey dung sea cucumber	*Holothuria mexicana*	F
Harlequin sea cucumber	*Holothuria grisea*	F
Annelids:		**4 species**
Bearded fireworm	*Hermodice carunculata*	F
Southern lugworm	*Arenicola cristata*	F
Social feather duster	*Bispira brunnea*	F
Spaghetti worm	*Eupolymnia crassicornis*	O
Angiosperms:		**2 species**
Turtle grass	*Thalassia testudinum*	A
Red mangrove	*Rhizophora mangle*	F

(*Only juveniles observed.)

Table 2.5 (cont'd). Species list of organisms found in the lagoon surrounding Santa Maria Island.

Common name	Scientific name	DAFOR
Algae:		**16 species**
Tall cactus alga	*Caulerpa lanuginosa*	O
Green feather alga	*Caulerpa sertularioides*	O
Sea pearl	*Ventricaria ventricosa*	O
Green bubble weed	*Dictyosphaeria cavernosa*	O
Mermaid's fans	*Udotea sp.*	O
Mermaid's tea cup	*Udotea cyathiformis*	O
Bristle ball brush	*Penicillus dumetosus*	O
Green jointed-stalk alga	*Halimeda monile*	O
Watercress alga	*Halimeda opuntia*	D
Stalked lettuce leaf alga	*Halimeda tuna*	D
Y branched algae	*Dictyota bartayresii*	O
Y branched algae	*Dictyota cervicornis*	F
Leafy flat-blade alga	*Stypopodium zonale*	O
White scroll alga	*Padina jamaicensis*	F
Y twig alga	*Amphiroa rigida*	O
	Schizothrix calcicola	O
Other species:		**5 species**
Upsidedown jellyfish	*Cassiopea frondosa*	F
Corkscrew anemone	*Bartholomea annulata*	F
Snapping shrimp	*Alpheus sp.*	R
Flat tunicate	*Botrylloides nigrum*	O
Stocky cerith	*Cerithium litteratum*	O
Total		**59 species**

The majority of larger fish, such as snappers, grunts, blue tangs, parrotfish and jacks were seen in the vicinity of the culvert at the southwest end of the lagoon, apparently entering the lagoon from Oracabessa Bay. These fish were few in number and generally remained in this area. The Great barracudas, however, were found frequently all around the lagoon. They also tended to surround the fish pots containing fish, of which there were at least three.

2.7.2 Oracabessa Bay

The bay was quite turbid at the time of investigation, although it appeared clear from the shore. The substrate of the bay is mainly covered by meadows of *Thalassia testudinum*, intermingled with green algae such as *Halimeda sp.*, *Penicillus sp.* and *Udotea sp.* A few

patches of bare sand occur throughout the site. In the vicinity of the culverts linking the bay to the lagoon, the seagrass beds become sparse and give way to bare sand. In this area the water temperature changes abruptly, as warm water exits the lagoon and mixes with the cool bay water. Sedimentation is quite high in the bay, with the seagrass and algae throughout the site coated with fine sediments. Figure 2.3 shows the distribution of bottom-living communities in Oracabessa Bay.

Coral growth in the bay is minimal, with the few corals observed at the entrance to the bay. Dead reef structures occur at the northern margin near the entrance of the bay, adjacent to the shore. These areas become quite shallow, approximately 0.5 m deep. These reef structures are composed of dead corals, and are overgrown with brown algae, particularly *Dictyota sp.* and *Padina sp.* Small coral colonies of *Millepora annularis*, *P. porites* and *M. complanata* were infrequently seen, and were generally confined to the outer parts of the bay. These areas are also home to two sponge species, the viscous sponge and loggerhead sponge, as well as the gorgonian, *Briareum asbestinum*. Seagrass is sparse in this area, and becomes dense in the inner regions of the bay.

Fish are few in the bay, and are mainly juvenile parrotfish, a few acanthurids and pomacentrids. Most of the fish seen were at the entrance to the bay and at the lagoon culvert. Near the lagoon channel, small French grunts and Harlequin basses were also seen.

Amongst the seagrass beds, echinoderms were observed, with sea cucumbers being quite common. The southern lugworm was also common in the sand patches and the more sparsely growing areas of seagrass.

2.7.3 Coral reef

The reef sites along the north face of the headland were investigated (see Figure 1.3) and a list of the species observed is given at Table 2.6. The fore reef is shaped by spur and groove formations, which at some points break up into large mounds rather than spurs. Relief in some areas may be as great as 3 m. The sea floor slopes very gently from the shore throughout most of the site, with the grooves having steeper slopes. The sand is

Figure 2.3 Diagram showing the distribution of benthic types in Oracabessa Bay.

Table 2.6 Species list of organisms found on the reef, north of the headland.

Common name	Scientific name	DAFOR
Fishes:		**21 species**
Blue tang	*Acanthurus coeruleus*	F
Doctorfish	*Acanthurus chirurgus*	F
Bar jack	*Caranx ruber*	O
French grunt	*Haemulon flavolineatum*	F
Dusky damselfish	*Stegastes adustus*	F
Threespot damselfish	*Stegastes planifrons*	F
Cocoa damselfish	*Stegastes variabilis*	F
Yellowtail damselfish	*Microspathodon chrysurus*	F
Sergeant major	*Abudefduf saxatilis*	F
Blue chromis	*Chromis cyanea*	F
Butter hamlet	*Hypoplectrus unicolor*	R
Indigo hamlet	*Hypoplectrus indigo*	F
Blue parrotfish	*Scarus coeruleus*	O
Stoplight parrotfish	*Sparisoma viride*	O
Striped parrotfish	*Scarus iserti*	F
Spanish hogfish	*Bodianus rufus*	R
Yellowhead wrasse	*Halichoeres garnoti*	F
Bluehead	*Thalassoma bifasciatum*	F
Squirrelfish	*Holocentrus adscensionis*	O
Trumpetfish	*Aulostomus maculatus*	R
Fairy basslet	*Gramma loreto*	O
Sponges:		**3 species**
Branching tube sponge	*Pseudoceratina crassa*	O
Loggerhead sponge	*Spheciospongia vesparium*	O
Viscous sponge	*Plakortis angulospiculatus*	O
Cnidarians:		**3 species**
Thread hydroid	*Halopteris carinata*	R
Sun anemone	*Stichodactyla helianthus*	R
Mat zoanthid	*Zoanthus pulchellus*	R
Gorgonians:		**3 species**
Corky sea finger	*Briareum asbestinum*	F
Black sea rod	*Plexaura homomalla*	O
Common sea fan	*Gorgonia ventalina*	O
Scleractinian corals:		**16 species**
Branching fire coral	*Millepora alcicornis*	F
Blade fire coral	*Millepora complanata*	O
Elkhorn coral	*Acropora palmata*	O
Finger coral	*Porites porites*	F
Pillar coral	*Dendrogyra cylindrus*	R
Yellow pencil coral	*Madracis mirabilis*	R
Lobed star coral	*Montastraea annularis*	F
Mountainous star coral	*Montastraea faveolata*	O
Great star coral	*Montastraea cavernosa*	R
Mustard hill coral	*Porites astreoides*	F
Massive starlet coral	*Siderastrea siderea*	O
Lesser starlet coral	*Siderastrea radians*	O
Symmetrical brain coral	*Diploria strigosa*	O
Grooved brain coral	*Diploria labyrinthiformis*	O
Lettuce coral	*Agaricia agaricites*	F
Ridged cactus coral	*Mycetophyllia lamarckiana*	R

Table 2.6 (cont'd) Species list of organisms found on the reef, north of the headland.

Common name	Scientific name	DAFOR
Algae:		**17 species**
	Derbesia sp.	O
Sea pearl	*Ventricaria ventricosa*	O
Green bubble weed	*Dictyosphaeria cavernosa*	O
Paddle blade alga	*Avrainvillea longicaulis*	O
Bristle ball brush	*Penicillus dumetosus*	F
Watercress alga	*Halimeda opuntia*	F
Y branched algae	*Dictyota bartayresii*	O
Y branched algae	*Dictyota cervicornis*	F
Leafy flat-blade alga	*Stypopodium zonale*	F
White scroll alga	*Padina jamaicensis*	F
Encrusting fan-leaf alga	*Lobophora variegata*	F
Sargassum	*Sargassum sp.*	A
Saucer leaf alga	*Turbinaria tricostata*	A
Tubular thicket algae	*Galaxaura oblongata*	O
Y-twig alga	*Amphiroa rigida*	F
Reef cement	*Porolithon pachydermum*	F
Mermaid's fans	*Udotea sp.*	O
Burgundy crust algae	*Peyssonnelia sp.*	O
	Schizothrix calcicola	O
Other:		**7 species**
Turtle grass	*Thalassia testudinum*	O
Southern lugworm	*Arenicola cristata*	F
Long-spined urchin	*Diadema antillarum*	F
Reef urchin	*Echinometra viridis*	O
Caribbean reef squid	*Sepioteuthis sepioidea*	O
Social feather duster	*Bispira brunnea*	O
Cymothoid isopod		O
Total		**70 species**

fairly coarse-grained and buff-coloured, made up of small fragments of *Halimeda sp.* and shells.

Most of the shallow reef was in poor condition, being dominated mainly by fleshy brown algae rather than corals. *Sargassum sp.* and *Turbinaria tricostata* are the most common algae on the reef, with *Dictyota sp., Padina sp.* and *Lobophora sp.* also commonly seen. Brown macroalgal cover ranges from 30% to almost 100% along the reef. Green algae are less common, with very little calcareous algae such as *Halimeda sp.* on the reef. Crustose coralline algae are present on the reef in relatively small quantities due to the lush growth of fleshy macroalgae. In areas where macroalgal cover is low, crustose coralline algae were visible in small areas at up to 50% cover. These areas were, however, few in number to limited to patches where corals were found. The ratio of

macroalgae to crustose coralline algae is often used as an indicator of reef health. When the ratio is high, as it is at this location, it suggests that the reef is in a degraded state, particularly when fleshy algal biomass is also high.

Live scleractinian coral cover is low, at less than 10% throughout the site. Figure 3 indicates the main areas where coral stands are found. In the vicinity of the points indicated, coral cover is approximately 10%, decreasing to less than 5% at the other areas of the site. *Montastraea annularis*, *Agaricia agaricites*, *Porites astreoides* and *Porites porites* are the most commonly seen corals. Relatively large stands of *P. porites* were found clumped together in one area, east of Snorkelers Cove. The coral heads were fairly small, at less than 20 cm in diameter. There were, however, a few large coral colonies with diameters exceeding 1 m. The grooves between the spurs were often covered in large quantities of old coral rubble, which may have been *Acropora cervicornis* and *Porites porites*.

Small sparsely growing patches of *Thalassia testudinum* were occasionally seen in some of the shallower areas of the site. In these sandy areas, mounds created by the southern lugworm were also quite common.

The fish community is dominated by scarids (parrotfish), acanthurids (surgeonfish) and pomacentrids (damselfish). A few large blue parrotfish were seen on the reef, which were greater than 30 cm in length. Both juvenile and adult fish were regularly observed. Some commercially important fish such as bar jacks and spanish hogfish were found only as juveniles. The fish were generally small in size and few in number.

Sponges and gorgonians were not very numerous on the reef, and were generally small. They were generally found on those parts of the reef where stony corals were also present. *Diadema sp.* was fairly common on the reef, particularly where algal growth was lower, towards the eastern end of the site.

2.8 WATER QUALITY

In 1994, ESL on behalf of the Client collected a series of water quality samples. These were taken from stations located along the coastline between Jacks River and Low Cay Beach. Nitrate values at that time were unusually high, although high nitrate values are not unique to the coast of Jamaica; similarly high values have been recorded in Discovery Bay. The high values in Discovery Bay are thought to be due to underground seepage of nitrate rich ground water, enriched by sewage effluent and agricultural chemicals. In Oracabessa the enrichment might be entirely due to underground sewage seepage. In both cases, phosphate levels are low presumably due to the fact that phosphates are stripped from underground flows by carbonate sediments. At that time, indicators of eutrophic conditions are present in Oracabessa Bay, particularly among species of green and red algae (*Gracilaria domingensis, Enteromorpha flexuosa, Uiva actuca, Dictyota cervicornis*).

The results of the 1994 water quality monitoring programme led to the following conclusions:

(i) The impact of land runoff on coastal water quality was evident. This is evidenced by salinity being sometimes reduced.

(ii) Turbidity and total suspended solids tend to be high especially in the inner bay, east and west promenades and the Jacks River estuary.

(iii) Nitrate and phosphate concentrations are occasionally high. They are particularly high in the boat channel, inner bay, promenade and Jacks River estuary.

(iv) Faecal coliform levels are occasionally high at all the marine stations and Jacks River estuary, indicating likely sewage contamination.

(v) Jacks River estuary shows the poorest water quality.

For the purposes of this study the surface water quality at three marine coastal stations (see Section 1.4.4 d) were sampled on 10 August 2004. The results are shown at Table 2.7.

Table 2.7 Results of water quality analyses of samples collected at Oracabessa on 10 August 2004.

Parameters	Samples			NEPA Marine Standards
	# 1	# 2	# 3	
Temperature (°C)	28.9	29.7	28.9	
Salinity (ppt)	35.7	35.2	35.7	-
TSS (mg/L)	39.7	34.3	34.0	-
Marine Nitrate (mg/L)	0.1	0.5	0.1	0.001-0.081
Phosphate (mg/L)	0.10	0.07	0.02	0.001-0.055
Total Coliform (MPN/100ml)	<3	<3	4	48-256
Faecal Coliform (MPN/100ml)	<3	<3	<3	<2-13

- ***Salinity***

Salinity measurements ranged between 35.2 and 35.7 ppt at the sampling stations.

- ***Water Temperature***

The water temperature at all the stations sampled was typical of Jamaican waters ranging between 28.9 and 29.7 ^{o}C.

- ***Total and Faecal Coliform Bacteria***

Faecal coliform bacteria are used as indicators of the possible presence of pathogenic organisms. The generally accepted limit for fecal coliforms in surface waters is 200 MPN/100 ml. Both the total and faecal coliform levels measured at each site were <3 MPN, well within the national standard.

- ***Total Suspended Solids (TSS)***

The total suspended solids concentrations at each station were greater than 30 mg/l. This is quite high. There is no national guideline for ambient suspended solids but there is a trade effluent standard of 10 mg/l. Comparison of this value with the levels recorded for the three stations sampled show that there is significant loading.

- ***Nutrients***

Nitrate levels exceed the national guideline at the three stations and phosphate levels were elevated at Stations #1 and #2. The data suggests that there is some nutrient enrichment of the coastal waters. This must be monitored to ensure that the levels do not get too high and begin to encourage the proliferation of algae.

In summary, the results of this one-off sampling exercise indicate that the current water quality at the project site is safe for recreational use and that there has been little change since the sampling programme carried out in 1994. Water quality should be monitored on a regular basis and the sources/s of the nutrients and suspended solids should be identified so that improvements can be implemented.

2.9 SOCIOECONOMIC CONSIDERATIONS

2.9.1 Oracabessa and its communities.

Oracabessa is an urban center comprising a core township and ten suburban communities. Generally, its influence extends from Galina in the east to Rio Nuevo in the west and, to a lesser extent, Guys Hill to the south. The town was once a thriving banana exporting center, but the community now characterizes itself as being in a state of prolonged economic stagnation, relying mainly on crop agriculture, tourism and commercial activity.

The communities can be geographically grouped as follows:

<u>Coastal communities</u>

◊ Galina.
◊ Race Course
◊ Oracabessa Town.

<u>Coastal foothills communities</u>

◊ Canoe Pond.

◊ Airy Hill.

Inland & Jacks River watershed communities

◊ Spring Head.
◊ Geddes Mountain
◊ Hamilton Mountain.
◊ Days Mountain,
◊ Barriffe Hall
◊ Mason Hall.

Of the 10 suburban communities, only those with discernable and direct project impacts are described. However, the incomes and employment effect of the project are likely to permeate all communities over time. Oracabessa, the town, is only briefly described here, as nearly all of the socioeconomic impacts and issues dealt with in greater detail, are centered on it.

a. Canoe Pond

This is a sprawling, unplanned, low-income residential community on the hillside on the southern side of the main town. It comprises about 300 units, mainly of poor housing stock. Observable economic activity is limited to roadside shops and bars, suggesting that employment takes place mainly outside of the community. The community appears to be high density with signs of urban decay. Similar to the other communities, sanitary conveniences are in the form of soak away toilets or pit latrines. Garbage collection is undertaken by NEPM Ltd. No tourism elements, actual or potential, were observed, and a most likely positive impact of the project on this community is in providing opportunity for employment as construction labour and, later, in domestic services to the project. The Canoe Pond drainage channel which carries storm and waste water through the town, crosses the coast land west of the development property and enters the bay near Murdock Beach. During storm events, the drain overflows at the main road and this can halt traffic through the town area. It is one of the issues that critics raise regarding the closure of the lower coast road by the property owners, it is claimed that this was originally intended to be an alternate route.

b. Airy Hill

Airy Hill is a continuation of Canoe Pond, up and over the crest of the coastal hills in which Oraocabessa lies. It comprises about 120 dwellings, mainly low income. The units here are more widely dispersed, making for a lower density community than at Canoe Pond. A negative impact on the project area arises from the periodic discharges of a drainage course which starts near Airy Hill and which flows through a concrete drain (locally called the Sodom drain) passing through the town and discharging into the sea just south of Hagee Beach. To prevent overflowing of the channel and the flooding of the area between the escarpment and the James Bond beach road, this canal will need to be enlarged along with the culvert under the road.

c. Geddes Mountain & Hamilton Mountain

These two adjoining communities lie in the line of hills that flank the Jacks River valley to the west. Geddes Mountain, the lower of the two, comprises about 50 middle and low income housing units. The NWC operates a pumping station that also serves Hamilton Mountain. Hamilton Mountain is the larger community having about 75 dwellings. It is also a middle and lower income, unplanned community, but with care being reflected in the maintenance and landscaping of several homes. Banana plantations surround both communities and these are presumed to provide an important source of employment. Sanitary conveniences are a combination of soak away toilets and pit latrines. These two communities drain to the Jacks River, and it is this situation that flags a concern for the project in relation to nutrient loading of the bay. Storm water run-off also poses a potential threat to the project as will be discussed in the section below on flooding.

d. Days Mountain, Barriffe Hall & Mason Hall

These communities lie in the south eastern mountain range, a watershed that drains westwards to the Jack River valley and northwards to the sea. They stretch out along the inland road leading from Spring Head back to Port Maria, which, at its higher levels, runs parallel with the main north coast road. Barriffe Hall is a middle class housing scheme, and a mostly planned community of about 50 dwellings. However both Days Mountain and Mason Hall, are unplanned low income housing settlements. This main road continues

past Firefly and rejoins the coast road just outside of Port Maria. Between these communities, it is estimated that there are about 500 – 1,000 dwellings.

These communities, draining as they do to the Jacks River, pose the same type of threats to the development area described earlier. It is likely that they will also share, over time, from the employment and incomes effect of the project. Mason Hall, however, has the only established tourism attraction found in the local suburban communities. This is the Zabai Tabai Taino Heritage Park, operated by what is referred to as The St. Mary Archaeological Association. This park borders on the existing Firefly tourist attraction, from which it no doubt hopes to benefit. If the communities, including Oracabessa, are to really benefit from the project and tourism in general, similar community based visitor attractions, must be developed.

e. Oracabessa

The administrative and commercial hub of the area is Oracabessa. Oracabessa comprises a main street, along which are located its market, police station, Type 2 health center, post office, and shops. Off this main are its Primary and High schools. Its major entertainment attraction lies within the project area. This is the James Bond Beach, a multi cultural theme park, offering stage shows, swimming and water sports. Murdock Beach and Hagee beach, within the project area, also offer recreational opportunities. The main fishing beach for the town is also in the project area, at a location referred to as the Dockyard.

The centerpiece of the town's tourism is the private resort, Goldeneye, around which the current project is being designed.

2.9.2 Demography

The population of Oracabessa in 1991 was 4,065 persons, and by 2001 had only increased, by 165 persons to 4,230. A measure of the comparative stagnation taking place in Oracabessa, is that the population size of Ocho Rios during the same period increased by 51%. According to STATIN 2001 Census, approximately 57% of the

population is in the under 30 years age range, and skewed slightly towards females (52%).

While the population composition of Oracabessa is of little direct importance to this project or the converse, the data suggest that the population is migratory and that this is likely to involve the younger age groups. More detailed analysis is likely to confirm that more males are leaving than females. Nevertheless, since the project is mainly residential and will require a fairly large pool of labour, it's benefit In this regard is likely to be very positive in this social context.

2.9.3 Education, Employment & Social Development

The principal educational institution in Oracabessa is the Oracabessa High School, formerly a comprehensive high school. The institution has an enrollment of approximately 1500 students and graduates about 300 annually at the Grade 11 level. It can be expected that some project employment benefits will flow to graduates of this school, since, other things being equal, employment opportunities would favour Oracabessa based residents. The educational institution most likely to benefit from the project is the HEART & NTA Grace Care & Skills Training Center, located literally on the project's boundary. This institution is already receiving financial support from the project sponsors. It currently graduates annually about 28 students trained in Housekeeping and Garment Construction. Its certification is at Level 1, the proficiency level offered within HEART/NTA for these courses. Its students benefit from a work experience program offered by the Goldeneye property, and some of its graduates have found permanent employment there. About 90 percent of enrollment comprises students from St. Mary, with about half this number coming from Oracabessa.

The project is also likely to confer a benefit to and receive a benefit from, other HEART/NTA programmes in neighbouring areas. For example, Hotellympia at Tower Isle offers certification courses for those wishing to become bartenders, waiters and chefs. Similarly the Runaway Bay Heart/NTA offers Level 2 certification in administrative occupations such as reception and telephone operating.

Island Sports Trust, is a not for profit organization that gives effect to the community development commitment of the Oracabessa Foundation, a creation of the developers of the project. Some indication of the scope and importance of this commitment is reflected in the fact that the sports trust reports having: trained over 714 teachers, sport leaders and coaches; exposed over 9,000 children to new approaches to physical activity; contributed over 12,500 pieces of equipment to various institutions. More recently it has established the Oracabessa Sports Council through which it hopes to better organize existing league competitions in football, cricket, volleyball, basketball throughout some 11 communities.

The link to the proposed project is considered sufficiently important that the trust's sports development officer is being sent for overseas research and training, to ensure the optimal alignment of the project with the aims and objectives of the trust. The developers are committed to ensure that beyond the direct employment and incomes effect of the project, this alignment will enable the project to be part of the vision for the social reengineering of the area.

2.9.4 Public Health & Safety

Discussions with the Public Health authorities in Oracabessa, indicate that the incidence of communicable diseases are within national parameters, and that this is thought to hold true for chronic illnesses. Oracabessa has a Type II Health Center that currently serves a population of about 15,000. Normally this would justify a Type 111 center, qualifying it to offer a medical doctor in residence and dental facilities. The nearest Regional Hospital is in St. Ann's Bay but other hospitals are located in Port Maria and Annotto Bay. Three medical practitioners have private practices in Oracabessa. Whereas, from a national health perspective, Oracabessa presents no unusual health or safety issues, an ambulance arrival and travelling time of one hour and a quarter, to the nearest Regional Hospital, should be viewed as a risk factor by the project.

Public health concerns are also centered on the three recognized squatter communities in the wider Oracabessa area. These are referred to as the Uddersfield squatter community, the Boscobel squatter community, and the Spicy Grove Squatter community. Only the

Spicy Grove community, which is the smallest of the three, is in the immediate environs of the project area. It adjoins the Cross Roads roundabout used for taxi and bus parking. Waste water from this settlement, runs off in the direction of the main road entrance to the Project, finding its way to the Jacks River to the west. However in flood events, this waste water crosses the main road flooding that section of the project area currently used by coal burners and not far from the intended site of the sewage treatment plant. It is likely that road alignment changes and improvements, brought about in the near future, by the Northern Coastal Highway Project, may correct this situation. Otherwise flooding in this area of the project will create an impediment to any future residential or recreational land use.

The town market, the site of which is directly above the development area, is also a health concern. It is a market that contains about 18 regular vegetable, fruit, fish and meat vendors. On market days the facility is up to capacity, and both the sanitary conveniences (pit latrines) and the solid waste infrastructure, are totally inadequate to cope with the demand. Garbage accumulates and is dispersed, due to an insufficiency of NEPM trucks to remove it and wastewater from washing down the market, flows to open ground. As a result waste finds its way over the escarpment and into the project area. Adding to the problems of its condition is the fact that the market offers no parking facilities to its users.

Farming communities surround Oracabessa. The importance of an adequate town market cannot be overstated. It will support rural farming opportunities by providing consumers easy access to fresh produce. This opportunity is even more pressing given the potential demand for fresh produce offered by the resort project. There have been several calls for relocation of the market, which if done should consider the preservation of this historic structure, possibly for alternative use as a crafts market.

Mentioned earlier, were the two-wastewater gutters that carry both solid and liquid waste into the bay area just adjacent to the James Bond Beach. One of these runs to the side of the market.

2.9.5 Water demand & supply

Oracabessa receives its water supply from one main, and two supporting sources. The majority of demand is satisfied by the Bogue supply in St. Ann (a spring). To a much lesser extent, water is also taken from the Pottinger Spring in Retreat, St. Mary, and from the White River, on the border between St. Mary and St. Ann. The National Water Commission distributes most of this water with a smaller amount being distributed by the St. Mary Parish Council

Those interviewed in Oracabessa report an adequate water supply. This is a fairly recent improvement, since the region did have a serious water shortage problem. The reason for the traditional shortages arose because the Blue Mountain North Basin, within which Oracabessa lies, produces marginally more water than is demanded according to 1990 figures supplied by the Water Resources Authority (Table 2.8).

Table 2.8 Blue Mountain North Basin - water supply and demand.

Average Annual Production	30.50 m cubic metres
Average Annual Total Demand	24.57 m cubic metres
Projected Demand in 2015	47.40 m cubic metres

Within the last three years, however, the Bogue supply in St. Ann has been tapped into and this has brought about a radical improvement in the availability of water in Oracabessa.

Treated effluent from the development's sewage treatment plant will provide the water for irrigation of the grounds. As designed for, the project will not have a water supply problem or impact to any significant degree on the availability of water to Oracabessa and its environs.

2.9.6 Transportation & traffic

Officers stationed at the Oracabessa police station describe traffic flow through Oracabessa in both directions as being generally moderate. For this reason traffic counts

in the town were not considered necessary. Daily peak flows occur between 7:00 am to 10:00 am and again between 3:00 pm to 7:00 pm. Heaviest traffic flows are reported on Saturdays, and during month end periods. Traffic congestion, when it does occur, is confined mainly to the area around Cross Roads, including that stretch of rising road which enters the town east of Cross Roads. This congestion is blamed on the public transport drivers who use the roundabout as a terminus, and who often double park and compete for fares, along this stretch of road. Traffic congestion in the town does become a serious problem whenever there are large events at James Bond Beach.

Cross Roads presents a difficult traffic management problem. It is essentially an intersection, governed by a roundabout, which has been 'captured' as a transportation park. Its location is strategic, since commuters in six of the ten named communities, must pass through it, to access Oracabessa or the main road to Ocho Rios. Similarly, traffic on the main north coast road, arriving or leaving Oracabessa to the west, must transit Cross Roads. Public transport operators refer to it as a feeding point, and claim that at the beginning of the morning peak hour, it is not unusual to count 30 vehicles awaiting fares. A 4:30 pm mid-week count of stationary vehicles gave 18 taxis, 2 mini buses and 2 pick-ups. Compounding the problem of space is the presence of several roadside vendors, within the roundabout. Additionally, some 9 permanent shops rely on this location for their trade. Within the last 2 years, a transport park has been constructed just opposite (north) of the roundabout. It is yet to be put into service. Transport operators claim that it was ill designed and does not serve their needs.

The Northern Coastal Highway Project (Segment 3) to be implemented in this area will involve a road alignment intended to improve the overall traffic management problems in Oracabessa. Since the construction tendering process for this segment of the highway is still in the planning stage, no useful time projections could be given for when these improvements will take place. A turning lane will be provided for traffic approaching from Ocho Rios and going to Spring Head. The existing roundabout will be separated from the main highway alignment and improved so that traffic will only flow in one direction around it. It is also intended to improve surface drainage in this area by expanding the existing channels to accommodate greater flows.

The entrance to the project access road is several hundred metres to the west of Cross Roads. During the construction phase of the north coast highway, impeded access to the resort development area can be anticipated. The Northern Coastal Highway Project will need to ensure that traffic safety issues are addressed in the vicinity of the Goldeneye development area. These would need to include the restriction of construction work to non-peak traffic periods, the appropriate positioning of flagmen during construction periods, adequate signage, and the approval of the local traffic authorities in relation to any other traffic regulations that need to be observed. Similarly, the NCH Project would need to ensure that mitigation of air and noise pollution is effective and that construction debris does not find its way into the project area, into the Little River or the bay.

Speeding is the norm in the vicinity of both entrances leading down to the development site and, during the construction phase, careful consideration must be given to the proper handling of heavy duty haulage vehicles through these. Haulage vehicles approaching the project area from the east should have the option of using the old coastal road and should not be allowed to pass directly through Oracabessa. In the post-construction period, the guests/residents of the resort are unlikely to contribute significantly to traffic flows and transport, moving guests to and from the main air links will not have to pass through the town. It is noted that the Old Wharf Road requires significant upgrading.

The James Bond Beach entertainment complex attracts criticism for creating severe traffic congestion when large staged events take place. Since this component remains an important part of the overall development concept, the developers must address the issue of adequate ingress and egress from the project area, irrespective of how infrequently these events occur. Central to the success of traffic flow management will be the provision of adequate parking, which should be designed around maximum rather than average vehicle loading conditions.

2.9.7 Land use issues

a. Coal Burning

There are four coal burners who set their individual kilns within the development area. More often than not only one or two are in operation during any given time. The location used has been a traditional one for this type of activity and predates the current generation of burners. One who has operated at this location for the past five years, estimates that the average total monthly production of coal from the site is 3,000 bags. The coal is sold from the site or taken to the market. The main purchasers are the jerk chicken and other 'pan' vendors as well as that wider public who still use coal for fuel. Interestingly, both James Bond Beach (during entertainment events) and Goldeneye were numbered among the important buyers. The coal burners claim that they try to operate in as environmentally conscious a manner as possible. They point to the fact that no complaints have ever been brought to their attention concerning air quality issues. They do not use logs from the property but buy and truck these in from assorted construction, agricultural, or household land clearing operations within the parish. They claim that they do not engage in random logging to secure supplies and point to the fact that the project itself plays a watchdog role.

Though not wishing to be relocated, the coal burners recognize that their operations are 'portable' and that if they eventually needed to relocate, they could do so, both to other locations within the project area (for example across the road) or to other properties. They are interested in understanding what the future holds for them, in relation to the project, but point out that the existing lines of communication to the project are open and good.

b. Fishing & bathing beaches

The two beaches used for fishing lie in close proximity to each other and fall within the greater development area. These are Murdock's Fishing & Public Beach and the 'James Bond 007' beach at Oracabessa Bay.

Murdock's, the traditional fishing beach and which lies outside of the development property was reported by the only 'fisherman' found there to have 12 boats. He claimed that about 12 fishermen and about 3 fish vendors use the beach. This claim is strongly

refuted by the fishermen at the Bond beach who claim that Murdock's has functionally ceased to exist as a fishing beach and is now only used as a public bathing beach. Murdock's Beach, when visited, had two boats at berth. The beach has a concrete building with 8 gear sheds. Separate changing rooms and toilet facilities for the public, form part of this concrete building. The supervisor operates a cook shop and provides refreshments apart from undertaking the upkeep of the beach. The supervisor acknowledged that in the 60's and 70's up to 20 boats berthed at the beach, supporting some 30 to 40 fishermen. The present decline of fishing in the area is attributed to the lack of a vibrant economy, a state that has existed since the demise of banana exports in the late 60's, but also to the destruction of the nearby reefs consequent to dredging for the deep water pier project. He estimates that the average catch per boat trip is about 30lbs.

The Bond 007 Beach berths about 30 boats of which 17 were actually seen at the time of the site visit. The Oracabessa Fisherman's Cooperative Union has offices across from the beach in a building provided by the developer (Plate 2.5).

Plate 2.5 Oracabessa Fisherman's Cooperative Union office.

According to the fishermen, there are about 40 fishers attached to the beach a few of whom actually berth in the lagoon surrounding Santa Maria Island. The fishermen claim to have a very good working relationship with the developer, and do not expect to be relocated. They are prepared to cooperate in any measures that can incorporate the existing beach into the resort's concept. The berthing of some boats in the lagoon is

accepted as being temporary, and these boats will be relocated to the beach, as soon as necessary.

With respect to the project, it is useful to set out the current official status of the different beach areas in the bay. This shown in Table 2.9.

Table 2.9 Status of beaches in the development area.

Name of Beach	NEPA Status
Murdock's Beach	A beach designated for use as a fishing beach. However its current status is acknowledged by NEPA to require some clarification.
Hagee Beach (part of James Bond Beach)	Licensed to the Island Group
Bond 007 Beach	Licensed to the Island Group and not a designated fishing beach.
Low Cay Beach (main beach on Outer Bank)	Undeveloped and therefore not licensed to the Island Group, but effectively controlled by it.

Fishermen have unfettered access to Murdock's beach but are subject to the accommodation of the project on all of the others. Arising from meetings that have been held by the fisherman's cooperative, the Fisheries Division and the developer, an agreement has been prepared and is ready for signature. This will allow specific fishermen to use the Bond 007 (Oracabessa Bay) beach.

With respect to possible issues regarding the beaches at Goldeneye, it must be noted that with the exception of the beach in front of the Fleming house, all the other beaches on the property are man-made.

c. Jet Ski Operations

A jet-ski rental and maintenance operation that used to operate in the area of the dockyard, and now slated for the Thalassotherapy Spa, has been closed down. Goldeneye Resort intends to continue to provide jet-skis for use by guests and otherwise, where privately owned, to allow their use in the bay and lagoon. Strict guidelines related to the control of speed and noise will be put into effect when operating within the lagoon. The jet-ski rental operation will be located near the fishing beach but no maintenance of these craft will be undertaken on the property.

2.9.8 Perceptions of the Project.

The community based consultations that may be a part of the permitting process will enable a wider cross section of opinions to be canvassed. Based on the interviews conducted for the socio economic data collection, there are mixed opinions about the benefits that the community will gain from the proposed land use. Generally, all persons interviewed accepted that the project was a positive initiative for Oracabessa. However the majority perceived that the development concept was low-density and that the project underutilized the potential of the site for creating a significant tourism development. They would have preferred the project to be aligned towards a larger hotel structure with a higher room count. A minority view held that the upscale target market would seed similar type investments and eventually open up the Oracabessa area to the higher density type tourism being advocated.

2.9.9 Flooding.

Although elements of the local flooding problem have been mentioned earlier, individuals interviewed offered some instructive observations. The main flooding occurs on the land to the east of the western entrance road leading to James Bond Beach. Storm water will pond (oftentimes to knee level, but occasionally up to the waist) as a result of inadequate drainage across the road. The storm water breaches several points in the escarpment, but also spills over from the main highway as it flows downhill from the direction of Cross Roads. The project site itself is not prone to flooding.

3. ENVIRONMENTAL POLICY, LEGISLATION AND REGULATORY FRAMEWORK

The environmental laws and regulations of Jamaica relevant to the proposed Goldeneye Resort development project are listed and commented upon below.

3.1 LEGISLATION AND REGULATIONS

3.1.1 Natural Resources Conservation Authority Act (1991)

This is the main environmental legislation that relates to the proposed project. This Act establishes the Natural Resources Conservation Authority (NRCA) with primary responsibility for ensuring sustainable development through the protection and management of the country's natural resources and the control of pollution. This is done mainly through an environmental permit and licence system.

The Act enpowers the Authority to:

- issue permits to the person responsible for undertaking any enterprise, construction or development of a prescribed category in a prescribed area [Section 9]. This section, the Prescribed Area Order, designates all of Jamaica as being within the prescribed area;
- issue licences for discharge of trade or sewage effluent or for construction or modification of any works for such discharge [Section 12 (1) (a) and (b)];
- request information or documents as the Authority thinks fit [Section 10 (1) (a)];
- request an environmental impact assessment containing such information as may be prescribed [Section 10 (1) (b)];
- request information on pollution control facilities [Section 17];
- revoke or suspend permits.

The Act also incorporates the earlier Beach Control Act, Wildlife Protection Act and Watersheds Act.

3.1.2 Beach Control Law (1955) and Beach Control Act (1978)

This act was subsequently re-authorized under the NRCA Act and is currently under review. The regulations of 1978 relate to hotels, commercial and public recreational beaches, regulated beach activities, care of beaches and rights of license. The Beach Control Act extends only to the foreshore; while it provides for the designation of protected areas, it does not address the basis for such designation, nor does it deal with the management of coastal resources landward or seaward of the foreshore. The Beach Control Law requires that an application be made for the modification of any beach/coastline and sets out requirements for the posting of public notices.

3.1.3 Wild Life Protection Act (1945)

Prohibits removal, sale or possession of protected animals, use of dynamite, poisons or other noxious material to kill or injure fish, prohibits discharge of trade effluent or industrial waste into harbours, lagoons, estuaries and streams. It authorizes the establishment of Game Sanctuaries and Reserves. Protected under the Wildlife Protection Act, inter alia, are six species of sea turtles.

3.1.4 Natural Resources (Prescribed Areas) (Prohibition of Categories of Enterprise, Construction and Development) Order (1996)

The Island and the Territorial Sea of Jamaica has been declared as a Prescribed Area. No person can undertake any enterprise, construction or development of a prescribed description of category except under and in accordance with a permit.

3.1.5 Natural Resources Conservation (Permits and Licenses) Regulations (1996)

These regulations give effect to the provisions of the Prescribed Areas Order. Hotel/resort complexes of more than 12 rooms, as well as sewage treatment facilities, are included on the prescribed list.

3.1.6 Natural Resources Conservation (Sewage Effluent) Regulations (Draft)

These regulations, when brought into effect, will cover the discharge of sewage effluent, the operations, monitoring and reporting mechanism of sewage treatment facilities.

3.1.7 Water Quality NRCA Act (1990)

The NRCA has primary responsibility for control of pollution in Jamaica's environment, including pollution of water. National standards exist for industrial and sewage effluent discharges to rivers and streams.

3.1.8 Tourist Board (Water Sports) Regulations (1985)

These regulations govern the operation and conduct of water sports.

3.1.9 Town and Country Planning Act (1958)

Established the Town and Country Planning Authority with responsibility for Development Orders to control both rural and urban land development, ensure proper sanitary conveniences, co-ordinate building of roads and other public services. Planning approvals for the project will have to be obtained from the Town Planning Authority at NEPA.

3.1.10 Quarries Control Act (1983)

This Act repeals the Quarries Act of 1958 and makes provisions for quarry zones and licenses, quarry tax, enforcement and safety. The proposed project should ensure that any earth materials used for the proposed construction of the resort are obtained only from licenced quarries.

3.1.11 Public Health Act

With respect to the ambit of this law, the Environmental Health Unit is required to review the design and plans for sewage treatment.

3.2 POLICIES AND REGULATIONS

3.2.1 National Policy for the Conservation of Seagrasses (1996)

This policy guides the issuing of licenses, or permits for activities such as dredging, disposal of dredged material, beach development and effluent disposal, which directly or indirectly affect seagrass communities. Seagrass meadows occur in the bay and the boat channel at Goldeneye.

3.2.2 Mangrove and Coastal Wetlands Protection - Draft Policy and Regulations (1996)

This policy provides a review of the issues affecting wetlands in Jamaica as well as Government's role and responsibility. Five main goals are outlined which include guidelines for wetlands development, cessation of destructive activities, maintenance of natural diversity, maintenance of wetland function and values and integration of wetland functions in planning and development. There are mangrove trees located at the edges of Santa Maria Island at Oracabessa.

3.2.3 Coral Reef Protection and Preservation – Draft Policy and Regulations (1996)

This document reviews the ecological and socio-economic functions of coral reefs, issues affecting coral reefs and Government's role and responsibility. Five main goals are outlined which include reduction of pollutants, reduction of over-harvesting of reef fish, reduction of physical damage from recreational activities, improving the response capability to oil spills, and control of coastal zone developments. The proposed hotel expansion project must endeavour to ensure that its onsite and shoreline reclamation activities do not threaten or harm the remaining coral reefs around the headland and the development site.

4. PROPOSED PROJECT

4.1 DEVELOPMENT CONCEPT

The resort development project to be implemented is a modification of the original concept proposed in the early 1990's for the development of the waterfront at Oracabessa. It intends to create a high-end tourist resort that is environmentally friendly and which will directly contribute to the economic development of the area. The developed lots will be sold to individual investors and the resort will be operated as a hotel on a pooled rental basis.

The headland has been subdivided into 46 house lots and Santa Maria Island has been subdivided into 10 lots. The units available for sale will comprise 22 villas, 22 cottages, 10 huts and 30 apartments. The apartments will be constructed of reinforced concrete and concrete blocks, the cottages and villas of concrete with timber upper floors, and the huts of timber. The designs will be in keeping with buildings elsewhere on the 'old' Goldeneye property.

Of the 262,000 SF of building construction, 252,000 SF will be carried out on 'new' Goldeneye. The total land area of 'new' Goldeneye is 8.9 hectares or 22.0 acres (958,773 SF) resulting in a plot ratio (covered building area to land area) of 26.1%.

Table 4.1 shown below summarises the proposed construction works. Heavy emphasis will be placed on landscaping. The external elevation of buildings will be 'soft' as they will be mainly of timber construction, or timber siding on reinforced concrete block or natural stone.

Five swimming pools will be constructed - a heated seawater pool in the Thalassotherapy Spa, the main pool at Low Cay Beach, a natural seawater pool at the end of the headland at Low Cay Beach, a pool on Santa Maria Island, and a small pool close to Snorkeler's Cove.

Table 4.1 Summary of construction works.

	NO. UNITS	AREA - SF
Residential – Phase 1		
o Villas: 3- & 4-bedroom	10	46,201
o Beach Cottages: 1- & 2-bedroom	12	14,877
o Spa Cottages on Santa Maria Island: 2-bedroom	10	14,957
o Huts at Snorkeler's Cove	10	12,807
o Apartments: 1-, 2- & 3-bedroom units	30	43,400
Total	72	132,242
Residential – Phase 2		
o Villa: 3- & 4-bedroom	12	54,000
Total Residential	***84***	***186,242***
Hotel Central Facilities		
o Main Clubhouse: restaurant, main bar, lobby, offices, entertainment, & main kitchen		16,380
o Thalassotherapy spa		26,120
o Spa Suites (to be built in the lagoon over water)	3	1,185
o Other Restaurants & Bars, Spa facilities, etc.		14,605
o Back-of-House		7,696
Total Central Facilities		***65,986***
Total Building Area 'new' Goldeneye		***252,228***

4.2 DRAINAGE AND INFRASTRUCTURE

Access to the units on the headland will be by gravel-top roadways. Water, irrigation and sewage mains, and electricity, telephone and CATV lines to each lot will be placed underground on either side of these roads. Vehicular activity on the property, under normal circumstances, will be restricted to the use of golf carts.

Access to Santa Maria Island will be via a wooden bridge capable of bearing golf carts. This will be placed in the vicinity of the spa and the infrastructure conduits to the lots will be hidden under the bridge span. The existing culvert between the Santa Maria lagoon and Oracabessa Bay is to be replaced by a stronger bridge, allowing for a wider opening. Information on the mode of construction of either bridge is not currently available but it is likely that piling of the footings will be necessary.

4.3 BUILDING SET BACK AND OTHER FORESHORE ENROACHMENTS

The development site is raised above sea level. Units on the northern side (facing the open sea) will be set back 30' to 40' from the revetment as recommended by the coastal engineering study (CSI, 2004). These units will be approximately 10' asl. The setback will provide an easement for heavy equipment to access the revetment for purposes of maintenance and repairs.

Those units along the sheltered southern side of the 'Outer Bank' and at Santa Maria will have small piled decks or platforms over the water and satellite rooms that will encroach about four feet over the water (see Figure 1.2). Elsewhere in Oracabessa Bay, there will be 2 piled piers (see Figure 1.2) to facilitate pleasure boats and sailing craft (40 ft – 60 ft range). Two water sports docks (see Figure 1.2) will be placed along the western side of the causeway. Both will be piled. The resort will not provide boatyard or refueling facilities nor is there any intention to operate the bay as a port or harbour.

In this context it is appropriate to mention that the developer is seeking permission from NEPA to establish the lagoon around Santa Maria Island as a private waterway. The lagoon is presently used to a very limited extent by fishermen since there is no throughway to Oracabessa Bay and the fishing beach. This would ensure privacy and quiet for the spa and allow for safe swimming in front of the villas and cottages on the waters edge. This restricted use should positively maintain the important marine nursery function of the lagoon (see Section 2.7.1).

4.4 CENTRAL FACILITY

The central facility is to be located on the mainland, beside the fishing beach, and will comprise the guest reception (*port cochere* & lobby), entertainment area, restaurant, kitchen, shops, and parking for golf carts (see Figure 1.2). The Thalassotherapy Spa will be located where there is presently a small boatyard (Plate 4.1), which has been closed.

Plate 4.1
Existing boatyard. Site for new spa.

The resort hotel back-of-house operation will be located on what is referred to as Silvera Lands opposite to the main entrance to the development and access to the clubhouse and reception area. It will comprise a laundry, water storage tanks to hold 76,000 litres (200,000 gallons), and parking facilities. Parking will also be provided on space at the 'old' Goldeneye along with a valet service.

4.5 POWER SUPPLY & FUEL STORAGE

The overall demand for electricity by the site is estimated at 1.5 MW. Electricity supply will be provided by the power utility. A standby generating plant will also be located at Silvera Lands and a fuel storage tank with a capacity of 2,000 US gallons will be located nearby. The tank will be above ground and enclosed within a concrete bund built to the specifications provided by the fuel supplier.

4.6 SEWAGE TREATMENT AND EFFLUENT DISPOSAL

The sewage treatment plant to service the demands of the overall development (including Phase 3) will be built on lands owned by IJL and located near the property entrance road, about 800 metres (0.5 miles) to the west of the resort. The STP, using oxidation ditch technology (extended aeration), will have a capacity for treating 0.4 – 80 million litres per day (0.1 – 21 million gpd). The effluent, which will be treated to water quality standards that meet or exceed NEPA requirements, will be pumped back to the resort for use as grounds irrigation (Table 4.1).

Sludge from the sludge digester will be placed in a four-compartment sludge drying bed to allow the rotation of sludge drying. Drainage from the drying beds will be returned to the STP. The dried sludge will be used as soil conditioner on the property.

Table 4.1 NRCA Draft Sewage Effluent and Irrigation Standards

Parameter	Effluent Limit	Irrigation Limit
pH	6-9	-
Biochemical Oxygen Demand (BOD_5)	20 mg/l	15 mg/l
Chemical Oxygen Demand (COD)	100 mg/l	<100 mg/l
Total Suspended Solids (TSS)	20 mg/l	15 mg/l
Total Nitrogen	10 mg/l	-
Phosphate	4 mg/l	-
Faecal Coliform	200 MPN/100 ml	12 MPN/100ml
Residual Chlorine	1.5 mg/l	0.5 mg/l
Oil & Grease	-	10 mg/l

4.7 SOLID WASTE MANAGEMENT

Solid waste generated at the site will primarily be domestic in nature (paper, packaging, waste food, etc.). The restaurant will have a chilled food waste storage facility and the resort will have a compactor. The waste will be collected on a regular basis by a private waste haulage contractor and taken to the Haddon Dump in St. Ann. The compactor will be situated at the back-of-house facilities at “Silvera Lands”.

4.8 CONSTRUCTION WORKS

This section considers two distinct sets of construction works. Firstly, there are the activities associated with the repairs and improvement of the existing shoreline structures, and secondly, those related to the new construction of the resort. Apart from the buildings, the latter includes the construction of two bridges, five boat piers, twenty-three platforms, four piers and a boardwalk associated with the spa, and a dock near the mouth of the lagoon. Also, there will be reclamation of a section of shoreline near the central facility, desilting of a section of the lagoon, and deepening of the boat moorings in Oracabessa Bay. The drawings related to the coastal works are provided in Annex 1.

4.8.1 Shoreline protection

An engineering assessment of the shoreline at the development site (Coastal Systems International Inc., 2004) determined that various improvements were necessary. These include:

a. Revetment

   Repair and partial reconstruction of the 30-year old stone revetment along the northern shore of the headland (Plate 4.2) to provide adequate shore protection.

Plate 4.2
Looking NE along stone revetment on north side of headland.

This will require the operation of a large excavator at the top of the bank fitted with a hydraulic grapple to individually place and fit boulders on the slope. Constant sorting will be required as smaller boulders are removed from the slope and new ones of proper size are delivered from a nearby quarry.

b. Northwest groyne

The NW tip of the headland (Plate 4.3), highly exposed to incoming waves, requires strengthening with boulders.

Plate 4.3
Northwest tip of headland, in need of repairs and strengthening.

c. Stonewall

The majority of the shoreline not protected by the revetment is stabilized by cut stonewalls which have deteriorated in many places (Plate 4.4). It is proposed that toe walls should be installed, the voids filled, and the sinkholes backfilled or filled with grout or cement-stabilised sand.

4.8.2 Marine encroachments

a. Causeway bridge

Although the existing culvert (Plate 4.5) provides adequate flushing of the lagoon/canal, it is not strong enough to support heavy construction vehicles and

Plate 4.4
Stonewall along southern side of headland.

equipment. It is intended to replace the culvert with a single span bridge. This will allow for a larger cross sectional area, thereby improving the flushing rate, and provide access to the lagoon for small boats. The method of construction has not yet been specified.

Plate 4.5
Existing culvert between lagoon and Oracabessa Bay.

4.8.2 Resort construction

b. Santa Maria Island bridge

Apart from the construction of footings at either end, the span of this bridge will necessitate piling in the lagoon at the middle of the span. Piling will be done either

from a crane at the shoreline or by a pile rig mounted on a small barge. Details of the design and construction materials are not yet available.

c. Boat piers

Three wooden piled boat piers, each 68 ft (21 m) long, will be built out from the headland into Oracabessa Bay. Their use by boats will necessitate the deepening of the shallow water in this area by sediment dredging. All piles specified for the piers and docks are 12-inch diameter timbers.

Two wooden piled 45 ft (14 m) piers will also be constructed from the causeway, one to accommodate water sports activities.

d. Platforms

Twenty-three wooden piled platforms to facilitate swimming will be built at lots fronting the lagoon, both on the headland as well as at Santa Maria Island.

e. Spa cabanas

Three spa suites on piles are to be constructed in the lagoon and will be of timber construction. They are each approx. 275 SF in area and will be connected to land by timber walkways. All bathrooms will be located on land.

f. Deck and boardwalk

The existing piled deck at the eastern entrance to the lagoon will be rebuilt and a piled boardwalk built beside the spa and along the causeway.

g. Desilting of lagoon

That section of the lagoon between Santa Maria Island and the headland has become silted up with fine sediments. The developer intends to deepen this area to facilitate swimming and improve water circulation (see Annex 1). To do this It is proposed to use either an excavator or a crane fitted with a clamshell. Only soft sediments would be removed and excavation would not exceed – 4 ft (-1.2 m). The removed material would be stockpiled on adjacent land on the headland. Turbidity screens would be employed at either end of the dredging area and care would be taken to ensure

contained stockpiling and proper decanting of the supernatant. The dried sediments would be placed and compacted on the development site. The exact area and volume of sediment to be removed has not been estimated.

h. Deepening of bay area

Using similar equipment and procedures as for the above, the area around the proposed site of the boat piers would be dredged to more than – 6 ft. The area and volume of material to be removed has not been estimated.

i. Causeway reclamation

Sheet piling would be inserted around the area to be reclaimed and filled, possibly using material dredged from the lagoon and bay. The volume of fill material required has not yet been estimated.

4.8.4 Construction works

Construction camp and material staging areas will be located at places safely removed from the shoreline and drainage ways. Marl fill and other earth materials will be obtained from the nearest licensed quarries. Transport of materials will be carefully monitored to ensure that trucks are properly sealed and the transit of heavily laden trucks assigned to the project through the town will be minimized to the greatest extent possible. Access to Santa Maria Island during the construction phase will be provided by barge or by the permanent bridge that will be built.

4.9 LANDSCAPING

As many of the existing trees on the headland and Santa Maria Island will be retained as possible. A landscaping firm has been retained to ensure construction of an aesthetically pleasing resort that is environmentally sensitive and one that enhances the natural features and characteristics of the site. The footprints of individual villa units are to be carefully placed and oriented to save existing trees and enhance outlooks. Shrub vegetation that will have to be cleared will be stockpiled and later shredded and reused on site for soil amendment and mulching purposes. A plant nursery will be established.

The landscapers will design a replanting programme that will create a wooded environment that enhances the development of an indigenous flora and fauna and provides seclusion and privacy to the individual home units. The plants will be irrigated with treated sewage effluent.

4.10 SECURITY

The landward perimeter of the site will be discretely fenced. Electronic security, including CCTV, will be placed at strategic points. The service site across the road from the entrance will be similarly treated.

4.11 SKILLS AND TRAINING REQUIREMENTS

Trained staff will be required to provide services in STP operations, cooking, housekeeping, reception, spa operations, water sports, gardening, hotel administration, sales and marketing, etc. First call will be given to qualified persons from the adjacent community but where these skills are not available locally then persons from outside the area will be hired.

4.12 OTHER DEVELOPMENT PROJECTS

4.12.1 Northern Coastal Highway – Segment 3

Reference has been made above in Section 2.9.6 to the impending improvement of the main road through Oracabessa. These works will largely entail straightening and widening of the road. Access to and egress from the resort development site will be affected to a minor degree. Needless to say, dialogue with the road construction firm should be held to ensure minimal dislocation of access to the development site, particularly during resort construction works when truck traffic will be pronounced.

4.12.2 Boscobel Aerodrome Improvement

Discussions are underway to lengthen the runway at the aerodrome so as to be able to accommodate personal jets, the mode of transport likely to be used by many investors and visitors to the Goldeneye Resort facility.

5. POTENTIAL IMPACTS AND MITIGATION MEASURES

5.1 DEFINITION AND CLASSIFICATION OF ENVIRONMENTAL IMPACTS

An impact is any change to the existing condition of the environment caused by human activity or an external influence. Impacts may be positive (beneficial) or negative (adverse). They may also be direct or indirect, long-term or short-term, and extensive or local in effect. Impacts are termed cumulative when they add incrementally to existing impacts. Both positive and adverse environmental impacts could arise during the construction and the operations phases of the Goldeneye resort development project.

5.2 IMPACT MATRIX

An impact matrix is a simple but effective tool for identifying and demonstrating the possible impacts of human activities on the environment. Such a matrix has been constructed for the proposed Goldeneye Resort Development project. Here, the activities carried out during construction (Table 5.1) and post-construction or operational (Table 5.2) phases are arrayed against the various environmental factors that are deemed relevant to the site, or which may be affected indirectly as a result of project activities.

The impact matrix should not be misinterpreted to mean that all the identified impacts would occur during implementation of the project. The matrix serves to identify the potential impacts and significant concerns and leads to the next step of the EIA process, mitigation, which serves to determine appropriate measures to remove or ameliorate the adverse impacts that have been identified and to enhance the positive aspects of the development.

The following sections discuss the potentially significant impacts of the proposed waterfront development. For ease of discussion and presentation, the

INSERT IMPACT MATRIX Table 5.1

INSERT IMPACT MATRIX Table 5.2

corresponding impact mitigation measures are presented after the discussion of each impact. A summary of the impacts is given below at Tables 5.5.1 and 5.5.2.

5.3 CONSTRUCTION PHASE IMPACTS

5.3.1 Loss of land use options

The construction of a residential resort will involve the erection of permanent block and concrete structures on what is essentially a green field site. This will result in a loss of the options for alternative land use and thus represents an irreversible commitment of land resources. The loss of optional uses for the land in the future is considered to be a negative impact.

Mitigation:
N/A

5.3.2 Sea defense repairs - loss of corals and lagoon benthos

Repair and reconstruction of the northern shore revetment will involve the movement and placement of large rocks and boulders above the reef. During this process there may be dislodgement and falling of rocks on to portions of the coral reef at the toe of the slope. In the case of newly quarried boulders, fine sediments adhered to the rock surface will be washed into the sea during placement causing turbidity and direct damage to sessile organisms.

Reinforcement of the northwestern groyne will cause collateral damage to adjacent corals during placement of the concrete units only if rocks are dislodged.

Rebuilding of the cut stonewalls surrounding the bay and the lagoon and backfilling these structures may disturb fine sediments and also introduce fine sediments to the water column thus creating turbid conditions.

Direct damage to corals and reef habitat is a long-term impact given the relatively slow growth rates of corals and the precarious status of coral reefs in an age of global warming. In this context such damage would be limited but nonetheless should be considered as being irreversible. In this context, it is noted that the most significant damage to the reef at Oracabessa was done when headland was originally built over the reef.

Turbidity and sedimentation caused by fine particulates would be a short-term impact and not likely to be significant on the northern shoreline given the exposure to water currents. In the quieter environments of the bay and lagoon, turbidity will be longer lasting but not considered significant since these environments are typically subject to such short-term conditions and the organisms inhabiting these areas are tolerant of short-term turbidity episodes.

Mitigation:

Impact mitigation here seeks to reduce direct damage to the coral reef and coral colonies.

- *Employ skilled and experienced operators to move and place rocks and boulders at the revetment and to place concrete reinforced units at the northwestern groyne.*
- *The placement of rocks and boulders along the northwest face of the Outer Bank must not extend beyond the present base of the revetment.*
- *Pre-wash new boulders before placing them in the water so as to remove fine sediments, ensuring that washing is done at a location or in a manner that will not cause washout of fines into the sea, river or stream.*

NB The use of silt screens is not recommended in the vicinity of the reef as the screens are more than likely to snag on the coral, thereby causing more and worse damage.

5.3.3 Land clearing - loss of terrestrial habitat and biodiversity

Particularly in the case of Santa Maria Island, the clearing and removal of trees during the development of the lots will result in the loss of at least some part of the existing vegetation and, as a consequence, a possible reduction of arboreal habitat for epiphytes, lizards, tree frogs, and birds. Noise, vibrations, and intrusive activities related to construction works will tend to scare away animals remaining on the site after vegetation clearance. These are the environmental

trade offs for expansion of residential/resort area and the tourism industry. It is anticipated that most of the fauna will return after the construction works, especially after the remaining vegetation grows back or is otherwise replanted.

Mitigation:

Impact mitigation here seeks to retain and restore as much of the original and natural forested condition of Santa Maria Island and of the existing trees on the rest of the development site as possible and for the most part this would be would be implemented on a lot by lot basis as the development proceeds.

- *Construction of the subdivision paths should be carried out after identifying and locating all the mature and ecologically valuable trees (using qualified personnel) and aligning the roads as much as possible so as to save these trees.*
- *Finalisation of the layout plans for individual sites should be done only after superimposing the proposed villa footprint on the lot's tree survey drawing and then aligning the footprint so as to minimize tree removal and ensure protection of ecologically valuable trees. This should also take into account the scenic views and cleared space needed around the building to facilitate construction.*
- *Final site layout plan for each lot should identify areas suitable for replanting.*
- *Trees to be protected should be clearly marked and indicated on the landscape plan prior to the commencement of construction.*
- *Where it is unavoidable that ecologically valuable trees have to be removed, they should be relocated rather than destroyed, if practicable.*
- *The building contractor should be subject to punitive penalties for any breaches of the tree protection plan.*
- *The landscape plan should be prepared prior to commencement of site clearance and be subject to careful review and assessment.*
- *The landscape plan should seek to utilize low-maintenance native species tolerant of coastal conditions, typical of the surrounding areas, and attractive to birds. It must not include imported and invasive species.*

5.3.4 Piling works – marine sediment disturbance and noise

Pile driving will be of significant environmental concern during the construction works for Goldeneye. This activity will take place during;

a) construction of the bridge to provide access to Santa Maria Island,
b) construction of the retention wall for filling along the causeway, and
c) construction of the many piers, docks, and platforms, and the boardwalk planned for the development.

A pile driver, mounted on a crane or on a small barge, will be used to insert the piles.

Piling will produce a loud repeated clanging sound and the process of banging piles into the substrate will unavoidably disturb the soft sediments found at the piling location. This will place fine sediments in suspension and create turbidity. Apart from the disturbing noise which could affect nearby residents and fishermen, and the negative visual impacts of cloudy water, the suspended sediments can be transported by water currents away from the activity site to produce turbidity downstream and to settle on plants and fauna, many of which cannot tolerate sedimentation. The areas threatened by suspended sediments would be the in lagoon and Oracabessa Bay, the actual areas affected depending on the tidal stage and direction of current flow. The resultant loss of biological productivity would be a negative impact. These potential impacts may arise over and last for the duration of the piling works. It is estimated that piling works will take place intermittently over several weeks.

Mitigation:

- *Apply noise mitigation measures specified below at Section 5.3.7*
- *Restrict piling activities to normal working hours (8am – 4pm) so as to minimise the nuisance effects of piling noises.*
- *It would be preferable to use quicker jet insertion technology rather than pile driving to reduce noise levels and the duration of negative impacts.*
- *Deploy sediment barriers or silt screens in the water in a manner that will contain suspended sediments and prevent their dispersion beyond the area of activity.*
- *Establish appropriate water quality standards and monitor water quality around piling activity site to ensure proper containment of suspended sediments.*

5.3.5 Dredging – marine sediment disturbance

Either a large excavator or crane-mounted clamshell bucket, operating from the shore, will be used to remove the silt in the lagoon area west of Santa Maria Island and the sediments at the area proposed for deepening at the boat jetties in Oracabessa Bay (see Annex 1). Such dredging activities will inevitably destroy the extensive sea grass and algal beds in the area proposed for deepening and disturb the fine sediments placing them in suspension where they can be dispersed by water currents to settle over sensitive coral and benthic habitats.

The dredged material will be stockpiled on land within an adjacent and appropriately sized area surrounded by a low wall or earthen berm. The sediments will be allowed to drain and dry before being used as fill where required on the site. The interstitial water will be allowed to drain back into the lagoon.

Mitigation:

- *Deploy sediment barriers or silt screens in the water in a manner that will contain suspended sediments and prevent their dispersion beyond the area of activity.*
- *Prior to excavation, remove representative areas of sea grass and algae, store at safe location, and replant over cleared/excavated areas after dredging completed. Removal and replacement should follow approved plan for habitat removal and replacement.*
- *Establish appropriate water quality standards and monitor water quality around piling activity site to ensure proper containment of suspended sediments.*
- *Ensure proper sizing of sediment containment area so as to prevent movement of excavated sediments back into the water.*
- *Dredging project should be subject to an approved environmental monitoring and management plan*

5.3.6 Soil erosion

Vegetation clearance, road construction and excavation works related to construction of the houses and buildings will expose soils in the affected areas leaving them vulnerable to erosion by surface run-off and ultimately threatening adjacent coastal waters with high turbidity and sediment deposition, a negative consequence. The flat topography of the site would tend to

mitigate against erosive surface flows and the threat of turbidity should exist only for the duration of construction works before subsequent landscaping and drainage works reduce the susceptibility to soil erosion. Ultimately, it is the corals and inshore marine habitat that would be adversely affected by prolonged levels of high turbidity.

Mitigation:

- *To the greatest extent possible, phase site clearance so as to minimize the area of exposed soil at any given time.*
- *Re-cover exposed soils with grass and other appropriate species as soon as possible.*
- *Temporarily bund exposed soil and redirect flows from heavy runoff areas that threaten to erode or result in substantial surface runoff to adjacent marine waters*
- *Monitor areas of exposed soil during periods of heavy rainfall throughout the construction phase of the project to ensure that any incidents of erosion are quickly controlled.*

5.3.7 Nuisance dusting

It can be anticipated that a certain amount of air borne particulate matter (dust) will be generated by earth moving activities during site works and during off loading of marl. This situation will be worst during the dry season and during the afternoons when the winds are most prevalent. Given the relative remoteness of the site, air borne particulates should not pose a hazard to residents in the vicinity or downwind of the construction site but could affect nearby workers on the site. The occurrence of dusting is short-term, lasting for the duration of the construction activity.

Mitigation:

- *Access roads and exposed ground should be wetted in a manner and at a frequency that effectively keeps down the dust.*
- *Stockpiles of fine materials (e.g. marl) should be wetted or covered with tarp during windy conditions.*
- *Workers on the site should be issued with dust masks during dry and windy conditions.*

5.3.8 General construction - noise

The use of heavy equipment during site clearance and road construction works will inevitably generate noise, which may create a nuisance for nearby residents and guests at Goldeneye, particularly when working on the mainland (e.g. club house and spa) and pile driving (see Section 5.3.4). Albeit annoying, this negative impact will be short-term (limited to the duration of the construction works) and is not considered to be a significant threat to the health or well being of humans. Distance will help to ameliorate noises and for this reason the noises from activities taking place on the Outer Bank should not create a problem. Generally speaking, it helps that the development site is located below and in that sense removed from the town of Oracabessa

Mitigation:

- *Construction activities that will generate disturbing sounds should be restricted to normal working hours (8am – 4pm).*
- *Local residents should be given notice of intended noisy activities so as to reduce degree of annoyances.*
- *Workers operating equipment that generates noise should be equipped with noise protection gear. Workers operating equipment generating noise levels greater than 80 dBA continuously for 8 hours or more should use earmuffs. Workers experiencing prolonged noise levels of 70 – 80 dBA should wear earplugs.*

5.3.9 Earth material sourcing

Earth materials needed for construction (e.g. marl, sand) will be obtained from licensed quarry and mining operations. Conscious or unwitting purchase of these materials from unlicensed operations indirectly supports, encourages and promotes environmental degradation at the illegal quarry sites and causes medium to long-term negative impacts at source.

Mitigation:

- *Earth materials must be obtained from officially licensed and approved quarries and copies of the relevant licenses made available by the Contractor for inspection at the site.*

5.3.10 Materials transportation

The various materials required for construction and building (e.g. steel, blocks, lumber, marl, asphalt, etc.) will be obtained from sources elsewhere and transported to the site. Transportation of these materials, typically in over-laden and sometimes uncovered trucks, usually results in undue road wear-and-tear. Special note is made here of the presently weak road surfaces in the immediate vicinity of the development site which require upgrading.

In the case of fine earth materials, dusting and spillages occur on the roadways between source and site. Dusting degrades local air quality and material spillages worsen driving conditions and increase the risk of road accidents. These occurrences represent indirect, short-term, reversible, negative impacts on public health and safety.

Mitigation:

- *All fine earth materials must be enclosed during transportation to the site to prevent spillage and dusting. Trucks used for that purpose should be fitted with tailgates that close properly and with tarpaulins to cover the materials. The cleanup of spilled earth and construction material on the main roads should be the responsibility of the Contractor and should be done in a timely manner (say within 2 hours) so as not to inconvenience or endanger other road users. These requirements should be included as clauses within the contracts made with relevant sub-contractors.*
- *The transportation of lubricants and fuel to the construction site should only be done in the appropriate vehicles and containers, i.e. fuel tankers and sealed drums.*
- *As far as possible, transport of construction materials should be scheduled for off-peak traffic hours. This will reduce the risk of traffic congestion and of road accidents on the access roads to the site.*

- *Appropriate traffic warning signs, informing road users of a construction site entrance ahead and instructing them to reduce speed, should be placed along the main road in the vicinity of the entrance to the Goldeneye property during the construction period.*
- *Flagmen should be employed to control traffic and assist construction vehicles as they attempt to enter and exit the project site.*
- *Access to the site along the coast road from the west is prevented by gates at the James Bond Beach entertainment venue. These should be removed and temporary passage for trucks approaching from the west should be allowed during the construction period so as to avoid having to travel on the roads through the town.*

5.3.11 Materials storage

The improper siting of stockpiles and storage of sand, gravel, cement, etc., at the construction sites could lead to fine materials being washed away during heavy rainfall events into the drainage system and ultimately into the adjacent marine environment. This would not only represent a waste of materials but would also contribute to turbidity and sedimentation with consequent negative impacts on inshore marine water quality and possibly the ecology of the shallow marine environments.

Hazardous and flammable materials (e.g. paints, thinner, solvents, etc.) improperly stored and handled on the site are potential health hazards for construction workers, and spilled chemicals would have the potential to contaminate soil and inhibit plant growth in affected areas. It is not anticipated that refueling or maintenance of large vehicles will take place on the construction sites and therefore there should be no requirement to store fuel and lubricants on the sites.

Mitigation:

- *The stockpiling of construction materials should be properly controlled and managed. Fine-grained materials (sand, marl, etc.) should be stockpiled away from surface drainage channels and features.*
- *Low berms should be placed around the piles and/or tarpaulin used to cover open piles of stored materials to prevent them from being washed away during rainfall.*

- *Safe storage areas should be identified and retaining structures put in place prior to the arrival and placement of material.*
- *Hazardous chemicals (e.g. fuels) should be properly stored in appropriate containers and these should be safely locked away. Conspicuous warning signs (e.g. 'No Smoking') should also be posted around hazardous waste storage and handling facilities.*

5.3.12 Modification of surface drainage

The land cover ratio (building footprint as a ratio to land area) for 'new' Goldeneye is 18.5%. Even including the surface area of gravel-top roads, it is apparent that the site will not generate significant volumes of runoff during the periods of prolonged rainfall, especially given the intention to apply heavy landscaping.

Mitigation:

- *An appropriate storm water drainage system will be designed and installed.*

5.3.13 Construction waste disposal

Solid waste generated during site preparation and construction work would include cut vegetation and typical construction waste (e.g. wasted concrete, steel, wooden scaffolding and forms, bags, waste earth materials, etc.). This waste would negatively impact the site and surrounding environment if not properly managed and disposed of at an approved dumpsite. Cleared vegetation burned onsite would generate smoke, possibly impacting negatively on ambient air quality and human health. Vegetation and solid waste, if allowed to accumulate in drainage ways, could cause localised pooling and flooding. Pooling of water, in turn, would create conditions conducive to the breeding of nuisance and health-threatening pests such as mosquitoes. Poor construction waste management constitutes a short-term negative impact.

Mitigation:

- *A site waste management plan should be prepared by the contractor prior to commencement of building. This should include designation of appropriate waste storage*

areas, collection and removal schedule, identification of approved disposal site, and a system for supervision and monitoring. Preparation and implementation of the plan must be made the responsibility of the building contractor with the system being monitored independently.*

- *Special attention should be given to minimizing and reducing the quantities of solid waste produced during site preparation and construction. To reduce organic waste, softer vegetation may be composted onsite and used for soil amendment during landscaping.*
- *Vegetation and combustible waste must not be burned on the site.*
- *Reusable inorganic waste (e.g. excavated sand) should be stockpiled away from drainage features and used for in filling where necessary and/or possible.*
- *Unusable construction waste, such as damaged pipes, formwork and other construction material, must be disposed of at an approved dumpsite.*
- *The National Solid Waste Management Authority should be consulted to identify appropriate waste disposal site.*

**At the present time the official dump for Oracabessa is at Haddon, St. Ann.*

5.3.14 Sewage and litter disposal

Inadequate provision of toilets for use by workers can lead to ad hoc defecation in secluded areas on the site, thus creating unsanitary conditions and sources of fly infestation. Improper disposal of food cartons and other domestic forms of construction camp garbage could lead to littering of the site and pollution of adjacent coastal waters.

Mitigation:

- *Provide adequate sanitary facilities for workers, e.g. chemical toilets, to reduce the incidence bacterial loading to the surface waters.*
- *Proper solid waste receptacles and storage containers should be provided, particularly for the disposal of lunch and drink boxes so as to prevent littering of the site.*

- *Special areas should be designated for cooking and eating of meals where adequate garbage containers are available and controls can be imposed on littering.*
- *Arrangements should be made for the regular collection of litter and for its disposal only at the approved dump.*

5.3.15 Replanting and landscaping

Landscaping and replanting of trees will be carried out to enhance the ecology and appearance of the site. No details of landscaping plans or planting material are available at this stage but the plant species selected for replanting will in large part determine which types of birds, butterflies, and other fauna, if any, inhabit the site (gardens) after construction. In addition to enhancing the aesthetic appeal of the project site, landscaping provides the means for partially restoring the site's natural elements and ecological habitats. It is therefore a significant mitigation activity with a positive impact.

The landscaping plan must seek to avoid the use of non-native and potentially invasive species. It should include low-maintenance local species and the types of trees and shrubs used for feeding by local bird species. The landscape design should seek to encourage bird life, especially for the endemics, maximize shade and windbreak effect, as well as hide the roofline of the houses.

Mitigation:

N/A

5.3.16 Employment/Income generation

At this stage, it is not possible to accurately determine the number of workers that will be employed on the site during the construction phase but at peak construction it is estimated that 300 to 400 workers will be employed. These levels of short-term employment opportunities at this time would have a significant positive impact on the local economy and on regional unemployment.

Mitigation:

N/A

5.3.17 Roadside vending

Large construction projects attract significant numbers of vendors who erect stalls along the road near to the site entrances. Associated with this is the parking of taxis and other vehicles owned by site workers. The overall effect is to create a highly unsightly situation, which includes poor litter and solid waste management practice. From an eyesore point of view, this is not anticipated to be a major problem at the Goldeneye site since the site is removed from the main road.

Mitigation:

- *The contractor should identify, demarcate and fence a specific area within which vendors will be allowed to operate. This location should be removed from the side of the main road and, ideally, should be large enough to accommodate worker's vehicles.*
- *The vendors should be instructed to maintain the area in a tidy fashion and litterbins should be provided with arrangements being made to have these emptied on a regular basis and the contents disposed of appropriately.*

5.3.18 Visual intrusion on seascape

The development is comprised of single and two storey buildings located on seafront lands, which are below the general level of the town and largely out of sight. The proposed development will not impair existing views of the sea.

Mitigation:

N/A

5.4 RESORT OPERATIONS/HABITATION IMPACTS

5.4.1 Employment

On completion the employment of 200 to 250 persons is anticipated. This would represent a positive long-term socio-economic impact.

Mitigation:

N/A

5.4.2 Water supply

As indicated earlier at Section 2.9.5 the NWC supply is sufficient to meet the demands of the Goldeneye development. The increased demand for water is therefore not expected to have a negative impact on the water supply network in the area.

Mitigation:

- *Provide adequate water storage facilities to ensure adequate supplies for the development.*
- *See mitigation measures in Section 5.4.3 below*

5.4.3 Depletion of water resources

If the use of the villas implies a net increase in the number of foreign visitors to Jamaica it will also mean an increase in the demand on local water resources. Each bungalow should put the following water conservation devices or technologies in place.

Mitigation:

- *Install aerators/flow restrictors*
- *Install low flush toilets.*
- *Collect grey-water separately from sewage effluent and use for irrigation.*

- *Collect rainwater be from roofs and store for grounds irrigation.*

5.4.4 Sewage treatment and disposal

Sewage generated by the villas, cottages and apartments and the central facilities will be collected and pumped to the wastewater treatment plant. The construction of a dedicated sewage treatment facility for the development will be of obvious environmental benefit as will be the reuse of the treated effluents for irrigation of the grounds. The potential long-term issue relates to improper maintenance of the sewage collection and treatment system such that inadequately treated effluents become discharged to the open environment. Improper disposal of sludge is also a potential issue.

Mitigation:

- *Retain a fully qualified operator to ensure proper operation and maintenance of the STP.*
- *Ensure preparation and provision of a plant operations and maintenance manual.*
- *Undertake regular monitoring and testing of effluent to ensure compliance with NEPA sewage effluent standards and regulations.*
- *Employ means to stabilise sludge for use as soil conditioner.*

5.4.5 Thalassotherapy spa effluents

The spa will pump seawater from the adjacent lagoon at a rate of 38,000 litres per day (10,000 gpd) to supply the internal pool and seawater treatment rooms as part of an open circulation system. This water will be sand filtered, heated to 40^{o} – 45^{o} C and distributed to the pool (28^{o} – 30^{o} C) and treatment rooms (32^{o} – 34^{o} C). From the spa the water will be passed to a sedimentation chamber and then a sand filter (to remove particulates and oils used in the various types of treatments that will be offered), then exposed to U/V light before disposal in a tile field located immediately west of the spa. From the tile field, the salt water will eventually drain back to the lagoon.

Fresh water and toilet wastes will go to the separate sewage system.

Mitigation:

N/A

5.4.6 Solid waste disposal

Poor garbage management at the resort would lead to unsanitary conditions including vermin and fly infestation and odours as well as unsightly conditions. Although the means of solid waste collection and disposal have not been determined, it is expected that garbage management and good housekeeping will be practiced on the site and that problems arising from the improper storage of solid waste will therefore be avoided. An ozone compactor will be installed at the club house. It is also anticipated that a private waste contractor will be responsible for collection and disposal of waste from the site.

Mitigation:

- *Ensure regular collection of garbage by either public or private waste disposal service.*
- *Ensure waste is disposed of at Haddon dump near Walkers Wood, St Ann.*

5.4.7 Use of electricity

JPSCo Ltd. will supply power for the development site from the existing mains running along the main road. The incremental demand will be within the capacity of the system and this will be confirmed in writing by the utility. The expansion should therefore not cause any supply shortages to the rest of the system. However, this increased demand will commensurately increase the utility‘s use of fossil fuel to generate that electricity, and thus the project will indirectly incur negative impacts associated with greenhouse emissions.

Mitigation:

Mitigation measures relate to incorporating and improving energy management and conservation practices.

- *Sub-meters and real-time energy monitoring equipment, timers, photoelectric cells, thermostats, etc. should be installed in the villas and the other facilities.*

- *Install translucent shades and fluorescent lighting.*
- *Pipe insulation, tank lagging (not asbestos!) and heat recovery systems should be installed wherever it is practical to do so.*

5.4.8 Worker housing demand and uncontrolled settlement

Tourism resort development in Jamaica has not been matched by the corresponding development and construction of housing and the social infrastructure to meet the demand of increasing numbers of resort facility workers, etc. Therefore, squatting and informal settlements despoil the resort towns and worsen social tensions. This is viewed as an indirect, cumulative, long-term, reversible negative impact. The present project may add to the unplanned settlement problem in the local region

Mitigation:

- *Seek provision of adequate housing opportunities by relevant authorities for hotel workers to reduce incidence of squatting and unplanned development associated with resort development in Jamaica.*

5.4.9 Misuse of coral reef resources

One of the main natural attractions that will be available to owners and guests at Goldeneye is the coral reef via SCUBA diving and snorkeling. Unless the marine resource is properly managed the increased use of the site for recreational diving could result in degradation of the habitat by damage to corals from boat anchors, souvenir collection, and poor diving practice.

Mitigation:

- *Installation of boat mooring buoys at NEPA approved sites for use of dive boats and banning of anchoring directly over reef.*
- *Ban collection of coral reef souvenirs*

- *Provision of educational and environmental sensitization material on coral reef for guests and for hotel staff.*
- *Institute and support coral reef monitoring programme for Goldeneye.*
- *Seek to have section of reef area designated as a marine reserve/sanctuary where fishing is banned or where fishing pot minimum mesh sizes are imposed.*

5.4.10 Road traffic impairment

The number of vehicles owned or operated by persons directly connected to the resort is not likely to exceed thirty. Operations of the resort will also create traffic comprised of buses and delivery vehicles, say fifteen per day. It has been noted that the section of the North Coast Highway between Port Antonio and Ocho Rios is presently being upgraded and this will serve to ease the current traffic flow constraints in Oracabessa. It is unlikely that this additional traffic induced by the Goldeneye Resort development will cause any undue congestion in the medium to long term.

Mitigation:

N/A

5.5 SUMMARY OF IMPACTS

The impacts identified and discussed above are summarized in Tables 5.5.1 and 5.5.2.

The negative impacts of significance during the construction phase are:

- loss of land use options,
- damage to corals and other bottom dwelling organisms during repairs of the revetment and construction of the new south-west groyne,
- loss of benthic habitat during the excavation works to deepen the lagoon,
- sediment disturbance, turbidity, and noise related to the several types of piling activities, and

- inappropriate construction waste disposal.

Given the typically poor environmental practices on construction sites in Jamaica, particular attention should be paid to the monitoring of the construction works.

The significant negative impacts during the operational phase are:

- waste disposal, both solid and sewage,
- consumption of electricity generated by fossil fuel combustion,
- the demand for worker housing and other uncontrolled settlement induced by the project, and
- the misuse of coral reef resources by snorkellers and divers.

All the identified negative impacts can be successfully mitigated.

Table 5.5.1 Goldeneye Resort - Summary of construction phase impacts

ENVIRONMENTAL IMPACT	IMPACT TYPE								MITIGATION		
	Positive		Negative								
	Significant	Not significant	Significant	Not significant	Short Term	Long Term	Irreversible	Cumulative	No Mitigation Required	Mitigation Required	Reference to Mitigation Section
CONSTRUCTION PHASE IMPACTS											
• Loss of land use options			×			×	×	×	×		
• Sea defense repairs - Loss of corals & benthos			×			×		×		×	5.3.2
• Loss of terrestrial habitat & biodiversity				×	×					×	5.3.3
• Piling - Marine sediment disturbance & noise			×		×					×	5.3.4
• Dredging - Marine sediment disturbance			×		×					×	5.3.5
• Soil erosion				×	×					×	5.3.6
• Nuisance dusting				×	×					×	5.3.7
• General construction - noise				×	×					×	5.3.8
• Earth material sourcing				×	×					×	5.3.9
• Materials transportation				×	×					×	5.3.10
• Materials storage				×	×					×	5.3.11
• Modification of surface drainage				×		×	×			×	5.3.12
• Construction waste disposal			×		×					×	5.3.13
• Sewage and litter disposal				×	×					×	5.3.14
• Replanting and landscaping	×					×				×	5.3.15
• Employment/income generation	×				×				×		
• Roadside vending				×	×					×	5.3.17
• Visual intrusion on seascape				×		×	×		×		

Table 5.5.2 Goldeneye Resort - Summary of operations phase impacts

ENVIRONMENTAL IMPACT	IMPACT TYPE								MITIGATION		
	Positive		Negative								
	Significant	Not significant	Significant	Not significant	Short Term	Long Term	Irreversible	Cumulative	No Mitigation Required	Mitigation Required	Reference to Mitigation Section
OPERATIONS PHASE IMPACTS											
• Employment/income generation	×					×			×		
• Water supply				×		×			×		
• Depletion of water resources				×		×				×	5.4.3
• Sewage treatment & disposal			×			×				×	5.4.4
• Solid waste disposal			×			×				×	5.4.5
• Use of electricity				×		×				×	5.4.6
• Electricity generation (stand-by)				×	×					×	5.4.7
• Electricity generation (co-generation)			×			×				×	5.4.7
• Worker housing demand & squatting			×			×		×		×	5.4.8
• Misuse of coral reef resources			×			×		×		×	5.4.9
• Road traffic impairment				×		×		×			

6. PROJECT ALTERNATIVES

6.1 BANANA LOADING PIER

The site was originally reclaimed from the sea and created by the Urban Development Corporation for the purpose of building a banana loading pier and wharf. It was abandoned when the economics of the banana trade made the project non-feasible.

6.2 RESORT DEVELOPMENT

The developer purchased the site from the GOJ expressly for the purposes of creating a tourism resort in some form or another. Therefore, any consideration of land use other than that in this context would be irrelevant. Several variants on a village resort theme emerged over the past decade or more but the idea of focusing on the top end of the market has distinct benefits in terms of maximizing tourism dollar income relative to a low impact ecological footprint. The developer in this instance characteristically emphasizes and cultivates strong links with the local community, which puts the project on a path towards real sustainability.

6.3 NO PROJECT SCENARIO

This alternative implies that the site would be left in an undeveloped state. With no intervention, the site would become overgrown with opportunistic plant species and gradually the plant community would evolve into a dry coastal forest with an associated faunal complement of birds, etc. However, in the absence of some form of control and land management and in the context of modern Jamaica, it is almost inevitable that squatters would settle on the site creating a situation with all the attendant problems related to lack of basic infrastructure and tenure.

7. OUTLINE ENVIRONMENTAL MONITORING PLAN

It is strongly recommended that the environmental management plans, before implementation, be reviewed and discussed at a meeting of the developer. project manager, contractor, and environmental monitor so that environmental performance standards are clearly understood.

7.1 DEVELOPMENT SITE PREPARATION

Prior to general site clearance and road construction activities, the developer should have prepared an environmental management plan to be provided to the main contractor that would include the identification and location of the trees to be kept (this has already been done), construction activity schedule, proposed drainage works, dust control measures, etc. for review and approval by NEPA, the environmental monitor and the supervising engineer. The developer should present a tree survey on which the trees/vegetation earmarked for protection should be flagged and hoarded by the contractor.

7.2 BUILDING CONSTRUCTION WORKS

The entity selected to carry out environmental monitoring of the construction works should then prepare a generic environmental monitoring programme based on the findings of the EIA and the requirements of the development permit. This programme would be adopted for the construction phase.

The major elements of the environmental construction monitoring programme would include the following:

- Ensure that trees marked for protection are left untouched, especially on Santa Maria Island;

- Ensure that unnecessarily large areas of soil are not left exposed and uncovered for extended periods of time;
- Ensure site drainage and surface runoff controls, especially during and shortly after major rainfall events, to ensure there is no flooding, ponding, and runoff of surface water to the beach;
- Ensure compliance of construction works with site management and landscape plans;
- Inspection of quarry licenses to ensure earth materials are being obtained only from licensed operators;
- Ensure earth materials are transported only in covered trucks;
- Ensure stockpiles of fine materials are placed away from drainage features;
- Ensure good solid waste management practice;
- Water quality monitoring; and
- Ensure replanting of vegetation and trees that will encourage endemic birds.

8. APPENDICES

APPENDIX 1. Approved EIA Terms of Reference

Prepare an environmental impact assessment of the proposed resort development to include the following:

1. *Introduction - Describe the development project to be assessed and explain the executing arrangements for the environmental assessment*

2. *Background Information - Briefly describe the major components of the proposed project, the implementing agents, a brief history of the project and its current status.*

3. *Study Area - Specify the boundaries of the study area for assessment as well as any adjacent or remote areas that should be considered with respect to the project.*

4. *Scope of Work - The following tasks will be undertaken:*

   Task 1. Description of the Proposed Project - Provide a full description of the project and its existing setting, using maps at appropriate scales. This is to include: general layout (subdivision plan, road access, type/size of house, etc.); pre-construction and construction activities (including vegetation clearance); construction methods and works; duration of construction phase; plans for providing utilities, waste disposal and other necessary service; sewage treatment system maintenance, and storm water collection and disposal. Special reference will be made to the development plan submitted, in particular item 6 (Spa Suite over water) Item 9 (Docks Decks and Board walks and Item 10 (Balconies/Buildings over water) to indicate those structures that will be supported on the sea floor.

Task 2. Description of the Environment - Assemble, evaluate and present baseline data on the relevant environmental characteristics of the study area, including consideration of the following:

a) *Physical environment: geology, topography, soils, coastal features, climate and meteorology, hydrology, drainage and stormwater runoff, marine water quality, and natural hazard vulnerability. Particular attention will be paid to sea level rise and its implications for coastal protection.*

b) *Biological environment: flora, fauna, rare or endangered species, sensitive habitats, trees worthy of protection, species of commercial importance, and species with potential to become nuisances, vectors or dangerous. Reference will be made to the biodiversity significance of the area.*

c) *Socio-cultural environment: present and projected population, community structure, land use, other planned developments, recreation, water supply, public health, public and community perceptions of the project, and cultural/historical properties. This will include a description of the surrounding communities in proximity to the project area especially infrastructure.*

Task 3. Legislative and Regulatory Considerations - Describe the pertinent regulations and standards governing siting and land use control, environmental quality, health and safety, protection of sensitive areas and endangered species.

Task 4. Determine the Potential Impacts of the Proposed Project - Identify the major issues of environmental concern and indicate their relative importance to the design of the project. Distinguish construction and post-construction phase impacts, significant positive and negative impacts, and direct and indirect impacts. Identify impacts that are unavoidable, irreversible and cumulative. Special attention should be paid to:

a) Vegetation clearance and habitat destruction related to construction activities.

b) Existing flora, fauna and coastal resources, tree protection, replanting and landscaping.

c) Modification of existing drainage patterns and surface runoff during construction and post-construction phases.

d) Water supply and demand.

e) Sewage and waste water treatment, use and management. A detailed description of the proposed sewage treatment system inclusive of final discharge of sewage effluent will be presented in the EIA.

f) Solid waste management during construction and post-construction phases.

g) Impacts related to construction works including materials sourcing, transport and storage, building construction methodology, piling, de-silting, site management, noise, fugitive dust, traffic obstruction, and employment.

h) Resort operations and maintenance: spa, use of energy saving and resource conservation technology, vehicular traffic generation, and employment.

i) Socioeconomic conditions, effects on existing users of the coastal areas, infringement on rights of stakeholders, community involvement and public perceptions of the project.

j) Potential impacts of the development on adjacent property owners.

Reference should be made to the extent and quality of the available data and any information deficiencies and uncertainties associated with the prediction of impacts should be clearly identified.

Task 5. Analysis of Project Alternatives – Describe the alternatives examined for the proposed project that would achieve the same objective, including the "no action" alternative. Distinguish the most environmentally friendly alternatives.

Task 6. Mitigation and Management of Negative Impacts - Recommend feasible and cost-effective measures to prevent or reduce significant negative impacts to acceptable levels and present a draft environmental management plan for the construction phase.

Task 7. Environmental Impact Monitoring Plan - Prepare a draft plan for monitoring the implementation of mitigating measures and the impacts of the project during the construction phase.

Task 8. Assist in Inter-Agency Coordination and Public / NGO Participation - As and if required by the NEPA, assist in coordinating the review of the environmental assessment by the relevant government agencies and in obtaining the views of local NGOs and affected groups.

5. *Report - The environmental assessment report will be concise and limited to significant environmental issues. The main text will focus on findings, conclusions and recommended actions, supported by summaries of the data collected and citations for any references used in interpreting those data. The environmental assessment report will be organised according to, but not necessarily limited by, the outline below:*

- *Executive Summary*
- *Description of the Proposed Project*
- *Policy, Legal and Administrative Framework*
- *Description of the Project Environment*

- *Significant Environmental Impacts*
- *Analysis of Alternatives*
- *Mitigation Measures*
- *Impact Monitoring Plan*
- *List of References*

APPENDIX 2. References

Coastal Systems International Inc., 2004. Coastal Engineering Report – Oracabessa Development, Saint Mary, Jamaica. 30 pages + appendices.

Environmental Solutions Ltd., 1996. Final Report – Oracabessa Waterfront Development – Environmental Impact Assessment. 68 pages + appendices.

Cox, J. & O. Cox, 1997. Oracabessa – The town, the people & the waterfront development. 54 pages.

Smith, D.A.Y. & P. Warner, 1994. Report on Oracabessa beach development. 13 pages.

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