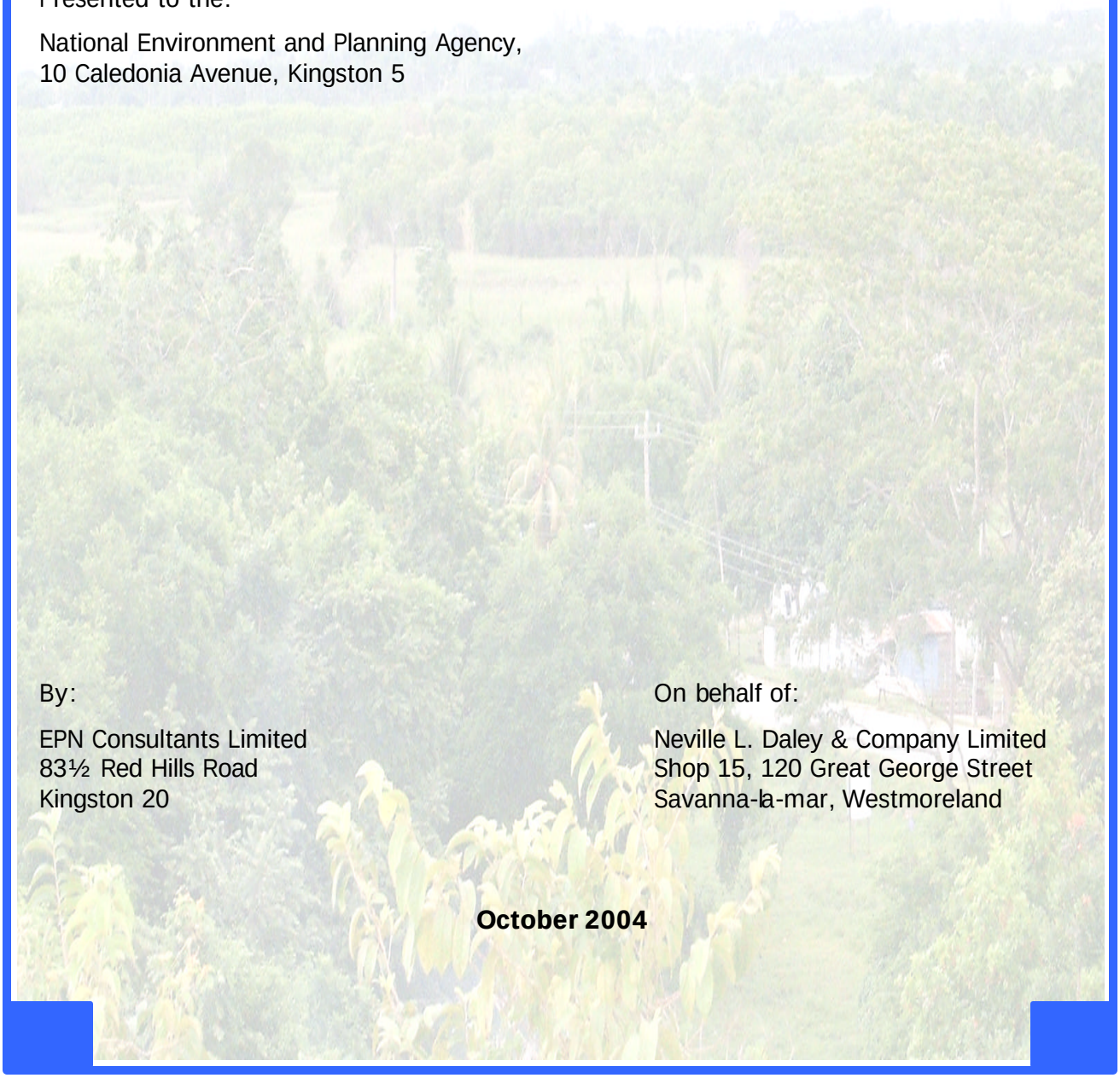
ENVIRONMENTAL IMPACT ASSESMENT OF A RESIDENTIAL SUBDIVISION – PART OF WHITEHALL PROPERTY, NEGRIL, WESTMORELAND

FIRST DRAFT

Presented to the:

National Environment and Planning Agency,
10 Caledonia Avenue, Kingston 5



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October 2004

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E1 The Proposed Action and Alternatives

The development is proposed for 21.87 hectares (54 acres) of land that would be subdivided in to 148 lots (143 of which are residential).

Physical Infrastructure **-** Roads -The proposed road alignment allows each property direct access to the proposed roadways.

Potable Water -Negril and its environs is supplied with potable water from the Logwood treatment plant.

Electricity - The Jamaica Public Service Company Limited (JPSCo.) at present through the Bogue power station provides electricity to Negril and its environs.

Telephone - Cable and Wireless (Jamaica) Limited is responsible for the nation's land telephone service, this service is available to commercial and residential customers in and around Negril, and would be accessible to the proposed Whitehall development community members.

Drainage - Storm water within the subdivision will be collected by kerb and channel flow to inlets into storm sewers, a detention pond located to the north of the site would hold excess water for final disposal in the existing South Negril River.

Waste Disposal - Solid Waste Disposal - The Western Parks and Markets (WPM) through the National Solid Waste Management Authority (NSWMA) is responsible for solid waste disposal in Negril. The waste will be transported to the Retirement Solid Waste Disposal Site in Montego Bay, St. James.

Sewage Disposal - Discarded vegetation would be removed and transported to the Retirement disposal site.

Transportation - Transportation will play an integral role in the development of the site. Transportation will be required for construction materials to the site, the movement of solid waste from the site and the everyday movement of the potential employees to and from the site.

Landscaping -There was no significant naturally occurring plant species on the site which could be considered in the landscape design, the introduction of ornamental species may be employed during the landscaping and site beautification process.

Project alternatives - The alternatives considered include:
The Proposed Development with modifications
The Proposed Development in another location

E2 Site Assessment

E2.1 The Physical Environment

The development is proposed for Negril that has Jamaica's longest white sand beach (7.2 km at Long Bay). In the context of the proposed Whitehall development the main road separates the site from the southern boundary of the Negril Great Morass.

The Whitehall property is located within the Negril sub-basin of the Cabarita Hydrologic Basin. The South Negril Orange River sub-basin is one of the sub-basins and Whitehall is located within this sub-basin. The South Negril Orange River sub-basin occupies an area of 142 square kilometres

The topography of the project site though predominantly undulating is diverse. The topography, generally on the Whitehall Property is typically subdued semi-rounded and rounded limestone hills mostly forming the Negril Hill. The Project site falls within the northern boundary of this area. The only realistic means of disposing of storm water is, therefore, through planned drainage structures across the main road into the South Negril River.

The projected post-development peak flows for the same return period was found to be 7,259 cfs. A marginal increase (13%) over the pre-development flows is, therefore, anticipated.
The Great Morass, which forms the Negril Basin, lies immediately north of the proposed development site, across the main road, and has an average elevation of 0.45 metres.
There is no groundwater associated with the limestone aquiclude and surface water is the main water type resulting from rainfall runoff.

The project site is just north of a northwest to southeast trending fault line.

Risk Assessment - The property is not coastal but precautions to minimize wind damage such as the planting of durable trees would form a part of the property's development plans.

There are no streams or major surface water systems located close to Whitehall. The South Negril River enters the Negril Bay to the west of the Whitehall Estate and is not a threat to any development that may take place at Whitehall.

Residents north of the development site when consulted indicated no major past flood events associated with drainage from the Whitehall property.

E2.2 Terrestrial Environment

The original vegetation of the area is within the dry limestone forest zone of north-western Jamaica. The present dominant vegetation type is secondary growth scrub and dry limestone scrub forest.

Mature dry limestone forests vegetation are usually characterised by a relatively low forest canopy and tall shrubs.

Assessment of Flora and Fauna - Vegetational assessment was conducted by sampling plants along 15 meter transects at five (5) sites. Tree species were identified according to Adams (1972). Extensive human impact had thereby produced a degraded ecosystem. While approximately 87% of the property was covered by woodland, none of the vegetation of the development area was natural forest. Overall tree species diversity was great due to the mixture of many non-native species of trees (such as African Tulip, Logwood, Coolie Plum, Lead Tree etc.) with species more typical of this life zone. Grass land covered an estimated 10 -13 percent of the development area and was present both in areas with deep soil and cleared exposed white limestone rock areas.

Logwood Scrub Forest – This habitat subtype represented the vast majority of the land within the north and western sections of the study area. In this habitat type, a single species (Logwood) dominated the community, making up over 80% of the tree species. The canopy was dominated by a few large emergent tree species; Guango, Almond, Dogwood, African Tulip and Cotton Trees.

There were seven (7) Jamaican endemic sub-species of birds present. Based on the survey the study area supports approximately 36% of Jamaica's extant endemic bird species.

Studies have shown that species composition within natural forest changes dramatically with degradation and human habitat conversion with sensitive species common to natural forest being the first to disappear (Douglas 2001).

E3 Socio-Economic Assessment

This section of the report seeks to analyse plans for the proposed development and recommend measures to ensure the promotion of comprehensive sustainable social and economic community development.

Most of the formal and informal housing activities in Negril have been occurring on the Whitehall property. Other land use in the vicinity of the site include mixed residential/commercial to the north of the site which is across the road. Immediately north of the property across the main road and behind the row of informal houses lies the southern boundary of the Great Negril Morass. The proposed development was previously approved for residential development.

The main economic base in Negril is tourism and this proposed residential development is expected to impact the town positively.

There are no schools at the High School level in Negril and those in the closest proximity fall above the pupil: teacher ratio set by the Ministry of Education

The town of Negril is however served by two health centres; the Negril Health Centre which is a Type III Health Centre that offers curative, post-natal, antenatal, family planning, child health, dental, nutrition, immunization services, treatment of common illnesses and maternal delivery services. The other health centre is a private facility.

Historic and Cultural Sites - There are no sites or monuments of historic or cultural significance on the proposed development site, however, the ruins of Whitehall Great House is located to the South of the project site. The Negril Royal Palm Reserve, to the north east is approximately five minutes away from the site.

Located within proximity of the site approximately ten minutes from Negril, just off the Sheffield to Springfield Road is the Negril Royal Palm Reserve.

Physical Infrastructure - Cable and Wireless (Jamaica) Limited is the main provider of land telephone service, this service is available in and around Negril and would be accessible to the Whitehall community.

The NWC operates 7 water supply systems in the region with the major one supplied by the Logwood Water Treatment Plant. Other systems are supplied by 4 springs and 2 river supplied treatment plants.

The major tourist urban area of Lucea/Negril located along the west coast of the parish will be benefiting from the Lucea/ Negril Water Supply upgrading project. It is expected that the National Water Commission through the Logwood Plant will supply potable water to the proposed development site at Whitehall.

The Ministry of Local Government and Community Development provides reasonable services through Western Parks and Markets in the region. Solid waste is now being transported to the Retirement Solid Waste Disposal Site in Montego Bay, St. James.

It is expected that sewage would be disposed of in the town's central sewage disposal system.

An upgraded road network facilitates communication with Negril by road. Although there is no specific study by the National Works Agency of traffic generated in the vicinity of the proposed development, this Principal Road is the main thoroughfare for traffic travelling along the South Coast to and from Negril.

Run off from the property could result in flooding due to an increased water level in the Morass, increasing the human vulnerability factor at adjacent properties in severe rainfall events.

The Negril Environmental Protection Trust is the main environmental watchdog in Negril. Personal communication with one of the officers did not reveal any threats to Negril from the development proposed.

E4 Environmental Impacts and Mitigation Measures

Preparation and Construction Phase

There can be obvious changes in species composition and distribution, habitat change/fragmentation, displacement, corridor impairment, endangered and special species. Landscaping plans are inclusive of the proposed replanting of trees to replace those lost by construction/clearing activities.

The White Hall Estate is located within the Negril EPA. The development site is immediately across from the Negril Great Morass and Game Sanctuary (NGMGS).

Development plans for the property involves the construction of a culvert across the main road where excess runoff including from the pond will be discharged.

Construction activities will lead to the generation of solid waste in significant amounts. Negative impacts caused at the site by waste material disposal will depend on the location of that site.

A waste management plan will be prepared and followed. Organic waste, namely vegetation, would be composted on site and used for soil improvement (soil conditioning) during landscaping. To avoid the harmful effects of poor solid waste disposal at least 4 skips will be strategically placed to ensure proper disposal of the waste material, a primary concern of the development

Operational Phase Impacts

There could be flooding of the site proposed for commercial use to the North and the main road due to increased surface runoff as a consequence of development.

In addition to poor site drainage to the North, it is expected that there will be a significant increase in storm water run-off during post-development phase of the project as a result of higher levels of runoff from roof of buildings and a general increase in impermeability of the site.

The shallow depressions located north of the project site serves as a detention pond by delaying peak flows into the development, resulting in changes in peak flow. A sustainable solid waste disposal management and public awareness and sensitization programme would be developed and implemented to promote good solid waste disposal methods in order to prevent garbage from being dumped into the surface drainage system which could disrupt the ecosystem within the Negril Great Morass.

E5 Cumulative Impacts

The Negril development over time will result in a variety of changes. This development will see a significant change in the land cover and landscape of the area.

E6 Residual Impacts

The process of planning is one which seeks to achieve the development of land through harmonious social and environmental integration. There will be an increase in storm water runoff that will enter the engineered drainage channels and into the South Negril River.

STUDY RATIONALE

This DEIA is a requirement of the National Environment and Planning Agency under the Natural Resources Conservation (Permits and Licenses) Regulations, 1996. Based on the information provided in the Project Information and the Permit Application Forms, NEPA was able to decide on the need for an Environmental Impact Assessment of the proposed project. The decision communicated to the project proponent is that the undertaking of an Environmental Impact Assessment would adequately provide the information required to analyze the significant socio-economic and environmental effects of the Proposed Action and to determine whether a permit would be granted for the proposed residential subdivision.

The purpose of this DEIA is to inform the decision makers in all agencies required to approve authorizing actions and the public in general regarding the anticipated significant environmental effects of the proposed subdivision and possible ways to mitigate these significant effects. However,

the information in this study does not control an agency's discretion on a project. Nevertheless, the local agency must adopt feasible mitigation measures or alternatives within its jurisdiction if they are to avoid significant environmental effects identified for the Proposed Action.

This DEIA contains the Table of Contents, an Executive Summary, and Chapters 1 through 6 which include photographs of the site and the Appendices which include the Subdivision Plan and letters from relevant government agencies directly related to this DEIA process. This Draft EIA is available for public review at the office of the National Environment and Planning Agency, 10 Caledonia Avenue, Kingston 5.

1.0 INTRODUCTION

1.1 Background

This development project proposal is a subdivision by Neville L. Daley & Company Limited which is being managed by Cosmo Whyte Architect Limited. This Draft Environmental Impact Assessment that was prepared by EPN Consultants Limited was commissioned by that latter company

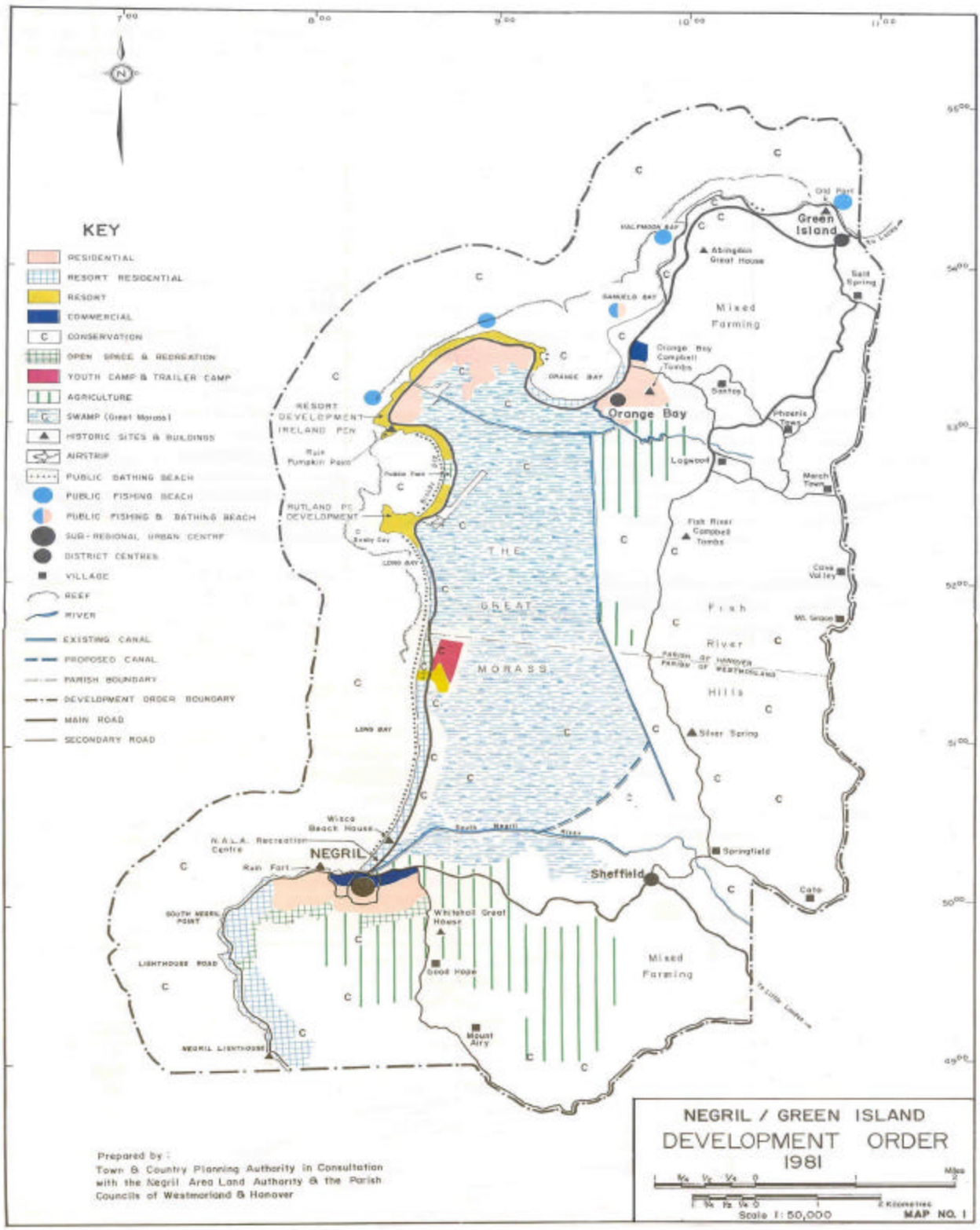
Negril is located towards the western tip of Jamaica in the parish of Westmoreland and Hanover. The boundary of Negril is intended to approximate the South Negril Orange River Watershed Management Unit, an area that covers some 46.6 square kilometres.

Negril has only recently been discovered as a site for tourism; in former times, its rocky West End was just a lighthouse site. The town was mainly a fishing village in the 1950s and 1960s, soon after which the 'hippies' and the 'flower children' of the 1970s naturally gravitated to the laid-back atmosphere of Negril. As Negril's fame spread, more and more visitors arrived in the area and the town transformed into a tourist resort with one of the highest densities of hotels and guest houses per hectare in Jamaica, accommodating thousands of visitors a week.

This Protected Area (Map 1) is currently guided by an Environmental Protection Plan (EPP) and co-managed by the Negril area Environmental Protection Trust (NEPT), local government (Negril and Green Island Local Planning Authority) and the National Environmental and Protection Agency (NEPA) through its Protected Areas Branch (NEPT 1997).

There is an existing Environmental Impact Assessment (EIA) for the entire Negril area; however these studies predated the declaration of the Negril Environmental Protected Area (EPA) in November 1997, leading to the formation of NEPT and the preparation of this Plan, the then Negril Coral Reef Preservation facilitated workshops for stakeholders in the Negril community. Below is an extract of the summary of the issues and problems identified by the Sheffield, Nonpariel, Good Hope communities which border the current development area (NEPT 1997).

- Illegal mining near Nonpariel
- Use of chemicals and fertilizers in agriculture
- Poor road drainage causes flooding



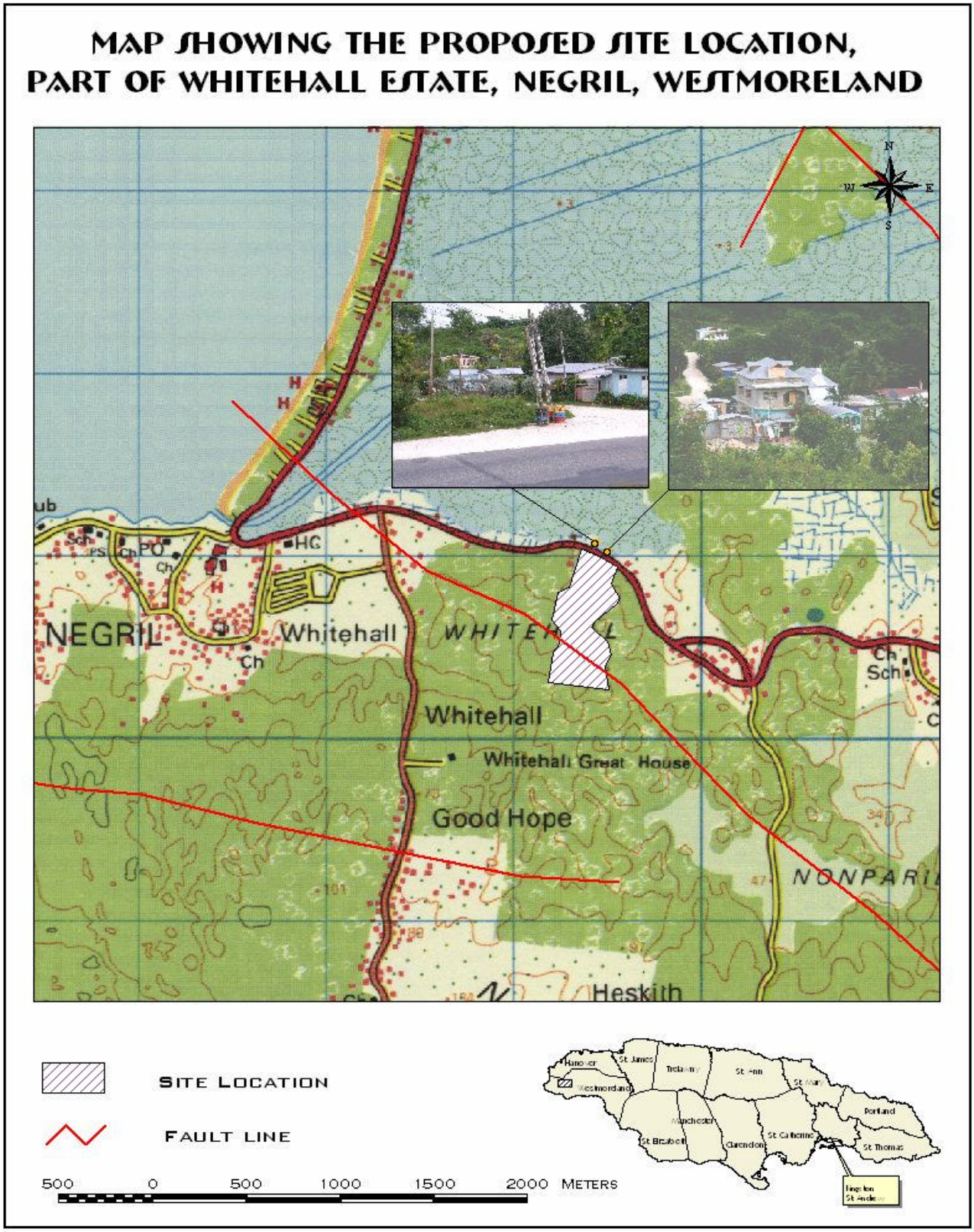
Map1- Showing the Negril/Green Island Protected Area

- Lack of proper sewage treatment and toilets,
- Use of old wells for sewage pits
- Cutting of hillside trees for charcoal burning and ground provision
- Fish in river have disease, could be due to pollution
- Inadequate quality of local water supply, possible salt contamination
- Need to protect the Royal Palm Reserve
- Unequal distribution of Nonpariel property
- Salt water intrusion into agricultural lands from canal
- Agricultural lands in morass taken for sewage ponds
- Good Hope marl pit needs water quality investigation.

Due to the time that the initial EIA (i.e. the pre EPA EIA) was done, many of the current concerns of the EPA were not adequately captured and addressed, and as such the relevant stakeholders have been working towards both increased baseline data for the area, and more comprehensive management system (comments from Simone Williams of NEPT).

With respect to the Negril Great Morass and Game Sanctuary, which neighbours the current development site, there have been bird studies among other flora and fauna studies. The majority of these studies have focused on the PCJ Royal Palm Reserve and surrounding areas. Therefore the flora of the Morass itself is overall known, even though there have been calls for more detailed assessment by NEPT (personal conversation with Simone Williams, of NEPT).

The proposed development site, Whitehall, is located approximately three (3) kilometres west of the Negril Town Centre along the main road leading to Savanna-la-Mar. The northern section of the development area is separated from the Negril Great Morass and Game Sanctuary by Nonpariel Road. The property boundaries of the proposed site from visual inspection are defined by the main road to the north, adjacent lots of the original subdivision forms the southern, eastern and western boundaries (see Map 2). The site comprises of 21.87 hectares (54 acres) of land. This is primarily a residential development with areas reserved for recreation/ open space and commercial land use.



Map 2 – Site location of the proposed Whitehall development, Negril, Westmoreland

1.2 Intended Uses of Draft Environmental Impact Assessment (DEIA)

This Draft Environmental Impact Assessment (DEIA) report is intended to provide baseline information, outline the potential impacts of the project and suggest mitigation measures. These mitigation measures along with the proposed Monitoring and Management Plan when implemented will serve to limit the extent of negative impacts on the receiving environment. This information will form the basis by which the National Environmental and Planning Agency (NEPA) under the Natural Resources Conservation (Permits and Licences) Regulations of 1996 will complete its evaluation of the project. The anticipated output the process is a permit form NEPA for the proposed residential development

2.0 THE PROPOSED ACTION AND ALTERNATIVES

2.1 The Proposed Subdivision

On the 21.87 hectares (54 acres) of land proposed for this development. A total of 148 lots would be subdivided to include residential lots (143), commercial lot (1), open spaces (2) and one (1) lot each for a water tank and a lift pump (see Table 1). The residential lots for the proposed development are designed to vary in size ranging from a minimum of 956 square metres to a maximum of 4,464 square metres.

Table 1 - Land Budget for the Proposed Development

Land Use	***Lot sizes***
Residential Lots (143).	997m^2 - 4,464 m^2
Commercial Lots (1)	9316 m^2
Open Space (2)	4,150 m^2 – 5,459 m^2
Water Tank (1)	506 m^2
Lift Pump (1)	582 m^2

2.2 Physical Infrastructure

2.2.1 Roads

The proposed road alignment allows each property direct access to the proposed roadways. The roads traversing the site will vary in width from 12.19m – 15.24m.The main roadway which will provide access to the site will have a reservation of 22.86m.

2.2.2 Potable Water

Negril and its environs are supplied with potable water from the Logwood treatment plant. The plant produces approximately 3.2 million gallons of water per day, which is lower than that required to adequately supply the area. The NWC is however aiming to improve its level of service by upgrading the plant to produce an additional 1.2 million gallons a day, which is expected to be completed in early 2005.

The site will be connected by the incoming main from the Nonpariel main road, the connecting pipes would have a size of 150mm; this size is needed to manage pressure losses during transmission. Pipes for distribution would be 100mm in diameter.

2.2.3 Electricity/Telephone

The Jamaica Public Service Company Limited (JPSCo.) at present through the Bogue power station provides electricity to Negril and its environs. It is expected that this company will provide electricity to the site at Whitehall.

Cable and Wireless (Jamaica) Limited is responsible for the nation's land telephone service, this service is available to commercial and residential customers in and around Negril, and would be accessible to the proposed Whitehall development community members. Digicel, Cable and Wireless and Oceanic Digital are three companies which provide cellular telecommunication services to the island in general, this form of communication is also easily accessible and will act as a more accessible means of communication for the residents.

2.2.4 Drainage

Storm water within the subdivision will be collected by kerb and channel flow to inlets into storm sewers, a detention pond located to the north of the site would hold excess water for final disposal in the existing South Negril River.

2.2.5 Waste Disposal

Solid Waste Disposal

The Western Parks and Markets (WPM) through the National Solid Waste Management Authority (NSWMA) is responsible for solid waste disposal in Negril. Refuse will be collected by either private trucks or the authority before, during and after construction. The waste will be transported to the Retirement Solid Waste Disposal Site in Montego Bay, St. James.

Sewage Disposal

There are many different ways of treating sewage but the most appropriate method for a particular area needs to be determined after careful consideration. Some of the most popular treatment methods include the use of waste stabilization ponds as well as mechanical processes that include the use of percolating filters or activated sludge. Regarding the disposal of such effluent which will be produced at the proposed development - linkage to NWC's central sewage disposal system in the town is the preferred option.

Spoils

Discarded vegetation would be removed and transported to the Retirement disposal site. Some of the materials generated during housing and road construction will be used as fill material, for example, at low points in the road profile and on lots that may be prone to flooding. The excavated materials from grading would, therefore, be used for backfilling.

2.2.6 Construction Materials

Basic construction materials such as sand, cement, marl and blocks would be obtained within the parishes of Westmoreland or Hanover considering the uniqueness in the location of Negril. This will have the effect of reducing transportation costs and reduce the use of energy (petrol). Cement, sand and marl would be obtained from authorized sources, which would not affect the local environment negatively.

As far as possible, other required materials will be sourced locally. Imported goods will be used where it is essential or unavoidable.

2.2.7 Transportation

Transportation will play an integral role in the development of the site. Transportation will be required for construction materials to the site, the movement of solid waste from the site and the everyday movement of the potential employees to and from the site.

2.2.8 Landscaping

Landscaping provides the means for making the site attractive and improving the visual aesthetic character. It also contributes partially to the environment by restoring the natural elements of the site such as large trees and open space. In this sense, landscaping activities will have a beneficial impact to both the residents and the environment.

There was no significant naturally occurring plant species on the site which could be considered in the landscape design, the introduction of ornamental species may be employed during the landscaping and site beautification process. Adequate protection measures will be instituted to prevent the cutting of the few larger tree species. The trees to be preserved should be clearly marked. Plant protection would serve to reduce the effects of site clearing, and make the environment more hospitable to birds and other avifauna species.

Trees, in particular native species of palms add significantly to the ambiance of the area and further highlight the image of Negril as a natural tropical destination. Trees identified of important landscape and/or aesthetic value identified included the African Tulip, Cotton, Guango and the Royal Palms. Many of these trees are also important sites for the endemic orchid *Broughtonia nigrilensis* and *Brassavola cordata*, in particular the Guango trees.

2.3 Analysis of Alternatives

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

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

2.3.1 The No Action Alternative

This alternative would see the cessation of project plans and the site retained in its present state. In the event that the development does not proceed, the proposed site is expected to maintain or develop the characteristics described below.

The vegetation of the site may be categorised within three (3) broad vegetational subtypes:

i. Grasslands – These areas were characterized by grasses and low herb covered land (both soil and rock) sometimes shaded by scattered trees and large shrubs in some areas. This occurred mostly towards northerly sections of the site.

ii. Logwood Scrub Forest – In this habitat type, a single species (Logwood) dominated the community, making up over 80% of the tree species. This habitat subtype represented the vast majority of the land within the north and western sections of the study area.

iii. Overcut-Degraded Dry Limestone Forest – This habitat type blended in with the logwood scrub forest primarily in the more rocky areas and was only distinctive in the more southerly sections of the property.

The important thing to note about the existing vegetation on the site is that while approximately 87% of the property is covered by woodland, none of the vegetation of the development area is natural

forest. The nature of the present vegetation suggests that the majority of the area had been previously clear-cut and the current vegetation had regrown and established a plant community heavily composed of non-native plant species. All the woodland that now covers the property is secondary growth with the majority covered by woodland in a relatively advanced stage of succession (i.e. generally larger trees). Extensive human impact has therefore produced a degraded ecosystem. Such human interference may be expected to continue whether in the form of agricultural use, grazing or settling.

The site is attractive to informal settlers, who also occupy the neighbouring property (across the road) as it is strategically located approximately three (3) kilometres away from the tourist resort town of Negril. The location of the site offers access to basic social services such as health, education etc. and physical infrastructure such as electricity and potable water. Transportation infrastructure is also in place as currently transportation to and from the town is available through route taxis and mini buses en route to Savanna-la-mar, Grange Hill, Orange Hill and other communities. Such services will incur a cost of $30 from the site to Negril. Further transportation services are available which provide travel to the neighbouring urban centres such as Montego Bay, Lucea and Savanna-la-mar. This access to such infrastructure would contribute to the livelihood and eventual uncontrolled growth.

2.3.2 The Proposed Development with modifications

The location of the proposed development within the environmentally sensitive Negril Environmental Protection Area requires that the development conform as much as possible to environmental standards so as to preserve the area and promote development that would be sustainable within the region. If there are issues concerning the project that may be enhanced, changed or modified to increase the acceptability of the project, then these issues would be considered so as to mutually satisfy all related stakeholders including the residents and relevant authorities.

2.3.3 The Proposed Development in another location

No alternative sites have been proposed by the developer for this planned development. A site alternative would require the identification of a suitable area, and would require an investment of several million dollars for its purchase, preliminary site reports, professional consultation etc.

3.0 SITE ASSESSMENT

3.1 The Physical Environment

The physical environment in Negril is characterized by rugged limestone, wetlands, approximately twelve kilometres of white coral sand beach and diverse coral reefs. Negril has Jamaica's longest white sand beach (7.2 km at Long Bay). The Negril Great Morass is Jamaica's second largest wetland (approximately 2,328 hectares), and contains mangroves, shallow estuaries, lagoons, salinas, herbaceous and swamp forests. The coastal boundary of the Negril National Park (that includes the Great Morass) is approximately 33 km. long and covers an area of approximately 160 sq. km.

The land use of the area around Negril included undeveloped uplands, rural residential areas, small farms, cane fields and large estates. In the context of the proposed Whitehall development the main road separates the site from the southern boundary of the Negril Great Morass.

3.1.1 Meteorology

Climate and Rainfall Data

Mean daily temperatures observed at the Negril Lighthouse from 1930-1960 was lowest in March (22.9°C) and highest in July and August 29.2°C and 29.1°C respectively. Little variation in mean maximum and minimum diurnal temperature over the period (8.3°C to 10°C) was observed[1]

The rainfall pattern in Western Jamaica follows the binomial distribution pattern typical of the island where rainfall peaks occur in May and October.

Table 2 shows 30-year mean monthly rainfall for the Negril Point Lighthouse rain gauge station. The results show the average rainfall in millimetres along with the number of rain days for each month. The lowest rainfall average was recorded in the month of January; there was steady increase in the months to follow. The period from May to October recorded the highest rainfall averages with October being the highest; the rest of the year saw a reduction of more than 50% rainfall.

[1] NCRPS, 1997, Negril Marine Park Management Plan

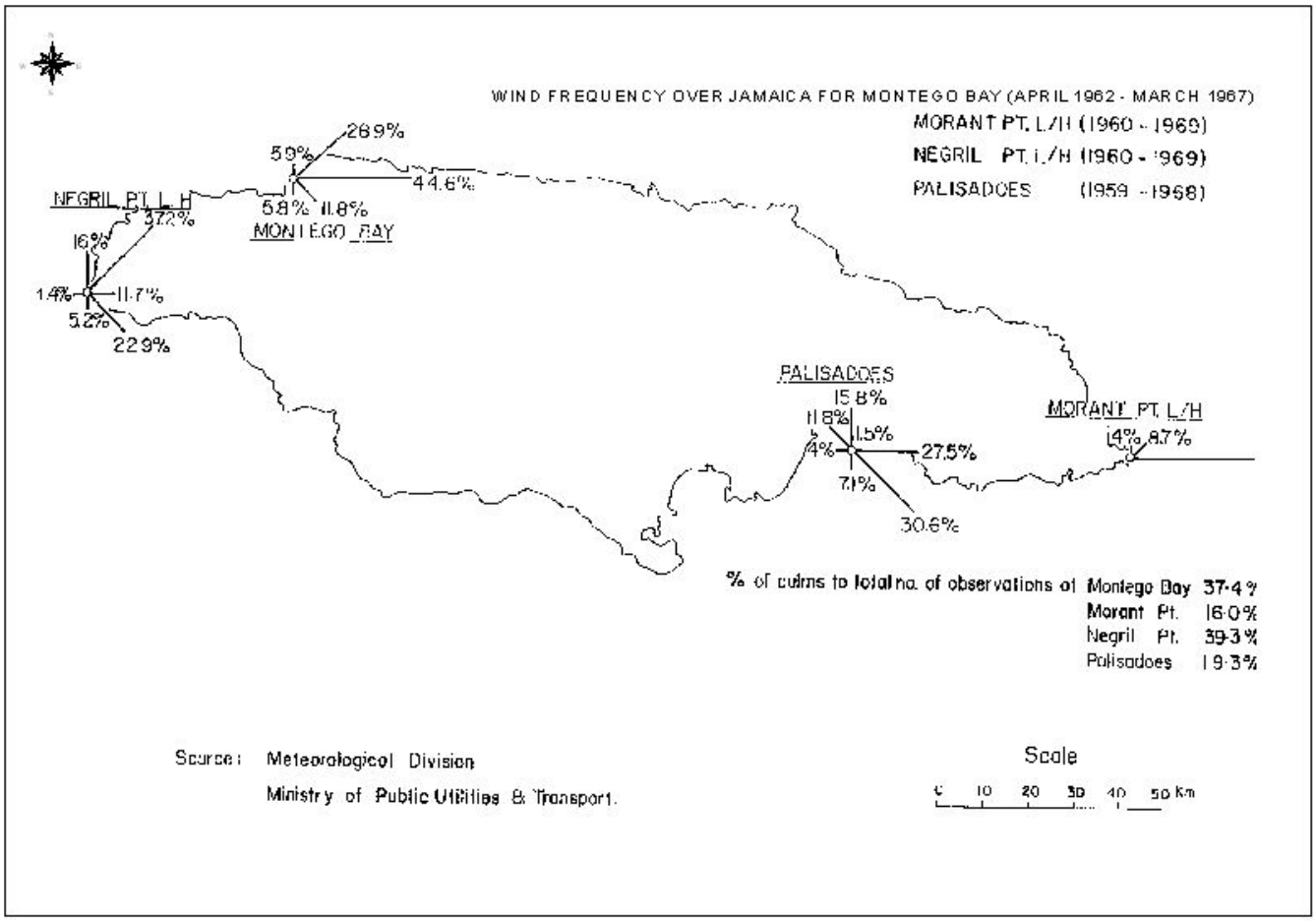
Table 2 - 30 year mean monthly rainfall (mm) for selected rain gauge for Negril Point Lighthouse (1951 - 1980)

MONTH	**RAINFALL** (MM)	**RAIN DAYS**
January	37	5
February	44	5
March	57	6
April	92	7
May	164	12
June	158	11
July	160	10
August	175	12
September	155	12
October	186	14
November	80	8
December	71	6

(Data Source: National Meteorological Service)

Prevailing Winds

Wind occurrences reflect the leeward sheltered position of the area from the dominant easterly Trade Winds. Over the period 1960 to 1969 the Negril Lighthouse was observed to be calm (39.3 %) most of the time, the winds that came from the north east (37.2%) and south east (22.9%) were the strongest meanwhile winds from the south (5.2%) and west (1.4%) were the lowest over the corresponding period (see map 3).

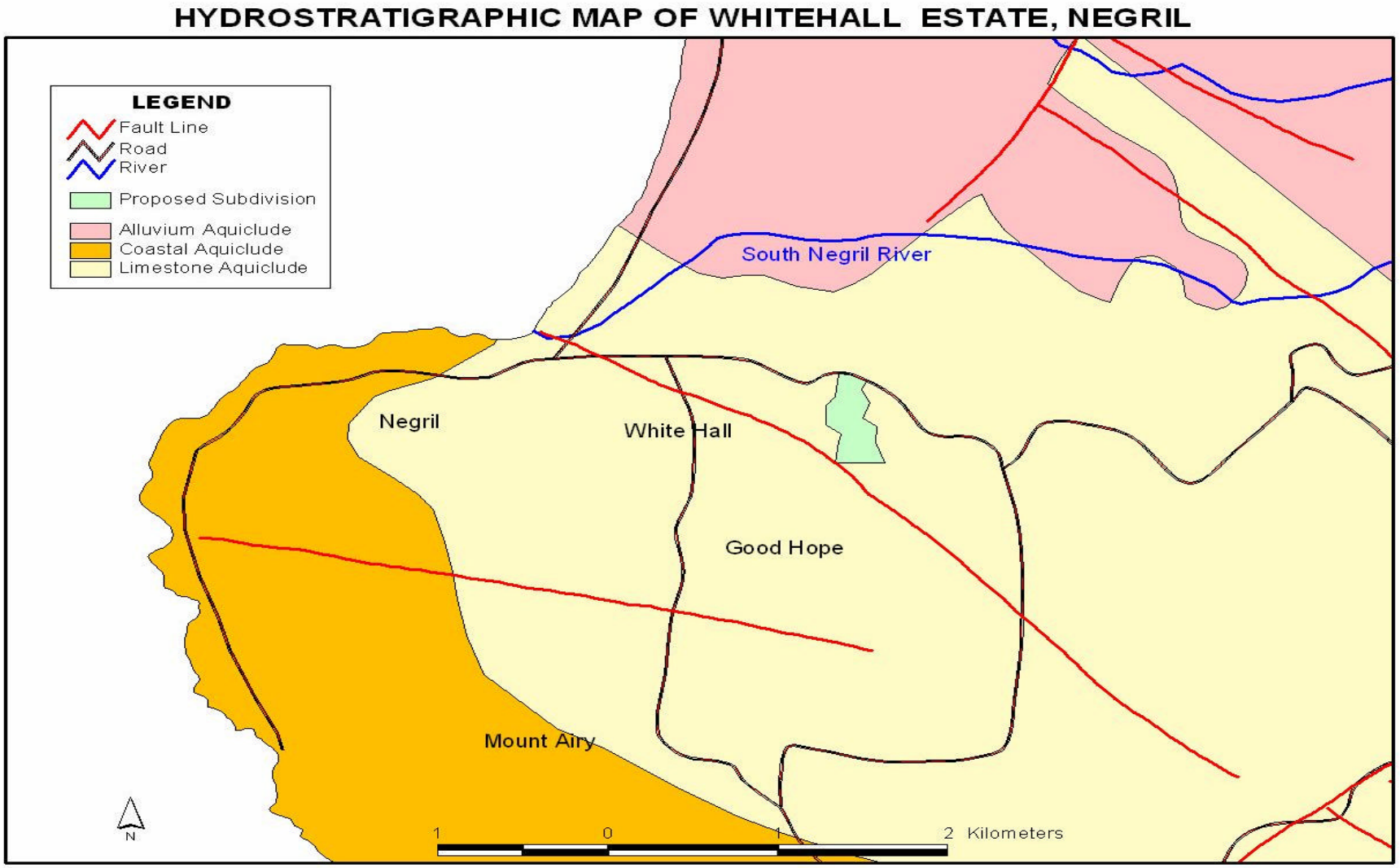


Map 3 - Showing wind frequency over Jamaica for Negril Point Light House 1960 – 1969.

Hydrostratigraphy

The Whitehall property is located within the Negril sub-basin of the Cabarita Hydrologic Basin. The Cabarita Basin occupies an area of 918 square kilometres in the south western corner of the island. The Cabarita Basin is divided into three distinct sub-basins and five hydrostratigraphic units. The South Negril Orange River sub-basin is one of the sub-basins and Whitehall is located within this sub-basin.

The South Negril Orange River sub-basin occupies an area of 142 square kilometres. The major hydrostratigraphic unit located in the south of the sub-basin is the limestone aquiclude with the coastal aquiclude fringing along the coast (see map 4). An aquiclude is a rock formation with insufficient permeability to support perennial well or spring yield. The limestone aquiclude within the sub-basin is thirty (30) kilometres square in area and Whitehall is directly located atop this aquiclude.



Map 4: Hydrostratigraphic Map – Part of Whitehall Estate, Negril, Westmoreland

3.1.2 Topography

The topography of the project site though predominantly undulating is diverse. The topography, generally on the Whitehall Property is typically subdued semi-rounded and rounded limestone hills mostly forming the Negril Hill. The Negril Hill is a relative extensive upland area of rugged limestone to the South that is 152 metres at its highest point.

The Project site falls within the northern boundary of this area. Topographically, Negril Hill is diverse, featuring caves, faults, crevices and sinkholes and stretches from the south-western coast eastwards. Shallow depressions of varying sizes are located between areas of high location (ECOTECH, 1997)

The highest point on the property is approximately 38 metres (125 feet). Towards the north of the property the eastern, western and northern boundaries ascend into higher undulating terrain.

Drainage

Generally storm water flows towards the north towards a drainage channel to the West that incises

Photo 1 - showing the existing pond to the north of the proposed site

the terrain and forms the boundary between the project site and the adjacent property. It follows most of the eastern boundary and discharges in a manmade pond at the most northern point

adjacent to the main road and an area of flat land where is accumulates after heavy showers (see photo). Although of lesser significance, there is no clearly defined drainage channel for storm water flows to the east.

Characteristic of the Montpelier Formation is the absence of established drainage networks but the development of feeder channels that drain towards the coast similar to the main drainage channel at the western boundary of the property. Presently, there is no outlet for this water and the pond adjacent to the main road serves both as a point of infiltration and evapotranspiration. As mentioned above, there also is a flat area of low permeability adjacent to the road that retains storm water. It is unlikely that the pond has the capacity to contain the additional runoff; this will therefore result in flooding of the main road and the adjacent property to the west. The only realistic means of disposing of storm water is, therefore, through planned drainage structures across the main road into the South Negril River.

Pre- and post-development run-off rates from the Whitehall property carried out by computer simulation of the discharge hydrograph from rainfall over a 25year rainfall return period (the return period recommended for use in drainage designs) was calculated at 6,429 cubic feet per second (cfs). The projected post-development peak flows for the same return period was found to be 7,259 cfs. A marginal increase (13%) over the pre-development flows is, therefore, anticipated. The percentage of increase is expected to decrease as the return period increases, reaching approximately 10% for the 100-year return period (ECOTECH, 1997).

3.1.3 Hydrology

Surface Water

The Great Morass, which forms the Negril Basin, lies immediately north of the proposed development site, across the main road, and has an average elevation of 0.45 metres. In the Negril Basin there are five channels in the natural surface drainage system, which have been modified by canals. The South Negril River (or South Canal), one of the five drainage channels, originates at about eighty two (82) metres above sea level flows into the morass. This is a natural drainage system for the property, which is separated from the Great Morass by the main road.

An area of high ground runs parallel to the Morass to the East. This is the part of the Negril Watershed that recharges the aquifer and the source of the Fish and Orange Rivers, which supply the

Blue Hole near Logwood, the source of the Lucea/Negril potable water supply.

Ground Water

There is no groundwater associated with the limestone aquiclude and surface water is the main water type resulting from rainfall runoff.

Attempts to develop groundwater through the drilling of wells tapping the limestone aquiclude at Mt Airy and Orange Hill to the south of Whitehall have met with poor results. The limestone formation is fine grained, tight and compact with a low primary permeability and little to no secondary permeability.

The aquiclude located in the south of the Negril Sub-basin acts as barriers to seawater intrusion into the limestone aquifer which is located north of Whitehall and to the east of the Great Morass. The groundwater in storage in this aquifer is protected by the barrier effect of the limestone and coastal aquicludes.

The property, however, besides being in close proximity to wells, is also traversed by a fault line, which increases permeability. The project site is just northeast of that fault line (see Map 4). Protection of groundwater from contamination is therefore most important.

3.1.4 Geology and Soil Type

The proposed subdivision is located on the Gibraltar-Bonny Gate formation of the White Limestone Group traversed by an inactive fault. Characteristically this rock type varies between soft chalks, shelly carbonate limestones, clayey and iron rich limestones or soft to hard rubbly limestones. These are dependent on the frequency of the faults in the area while rocks might contain hard fine grained micrite minerals.

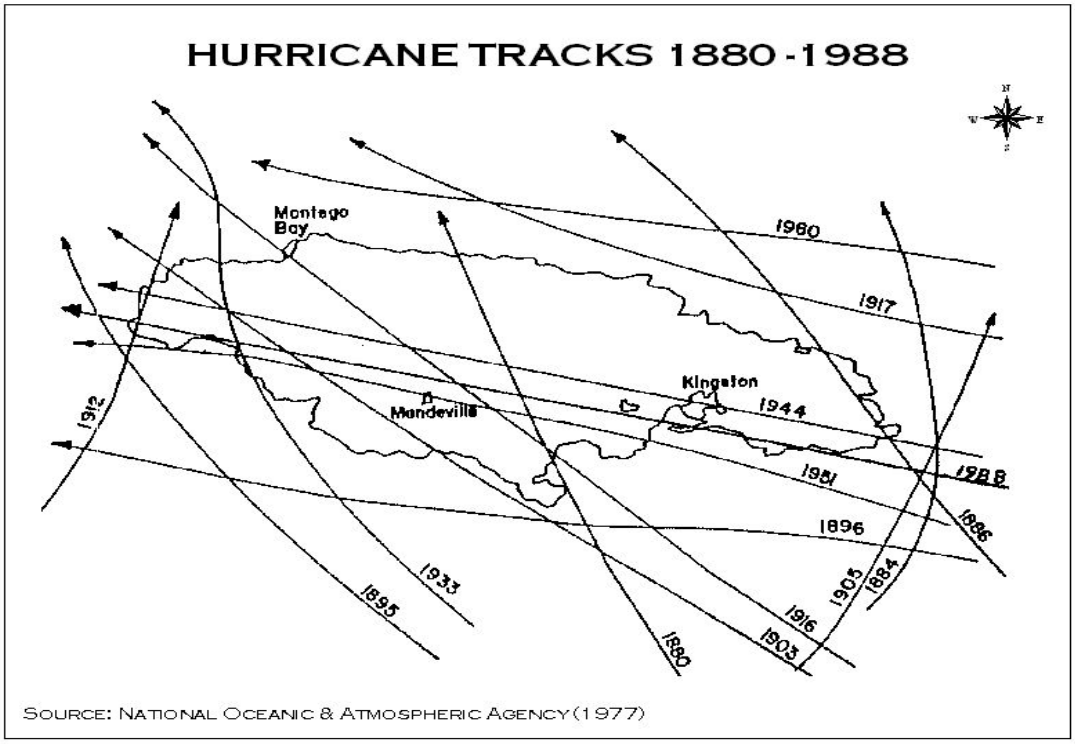
Under the influence of rock movement, the rock type is capable of developing steep sided, extensive flat top mountains/hills (plateaus/horsts). This rock type in conjunction with faulting (natural breaks in the rock body) and sink holes (although not present at this location) and depressions created due to its carbonate nature, can develop well defined underground drainage systems (karstic features). Permeability in the Bonny Gate formation is generally low through pores (primary) and can be very high through cracks and fissures (secondary). Slopes on this rock type generally have moderate stability which is dependent on soil strength, particularly in depressions. The Bonny Gate formation

has a reasonably good bearing capacity of 4000 KN/m^2, and dependent on clay content. Soils on this formation have a bearing capacity ranging between 40 – 500 KN/m^2. (ODPEM, 2004)

3.2 Risk Assessment

3.2.1 Hurricane

Jamaica experiences hurricanes during the annual hurricane season that lasts from July to November and tropical cyclones (directly or indirectly); the area like most coastal areas is susceptible to the effects of wind damage. The property is not coastal but precautions to minimize wind damage such as the planting of durable trees would form a part of the property development plans.



Map 5 – Hurricane Tracks from 1880 - 1988

3.2.2 Flooding

Drainage on the Whitehall property is controlled by the fault trending north-west/south-east which can potentially lead to excessive channel flow and flooding could affect the lower areas of the project site during periods of sustained meteorological activity, this especially so since the area is located in the vicinity of Negril; a community which is listed on the ODPEM's list of high risk flood prone areas. Evidence of poor drainage in surrounding areas such as ponds and swamp lands along with the

occurrence of depressions can strongly bolster the flooding potential of the area. However engineered drainage works should adequately cater to seasonal floods (ODPEM, 2004).

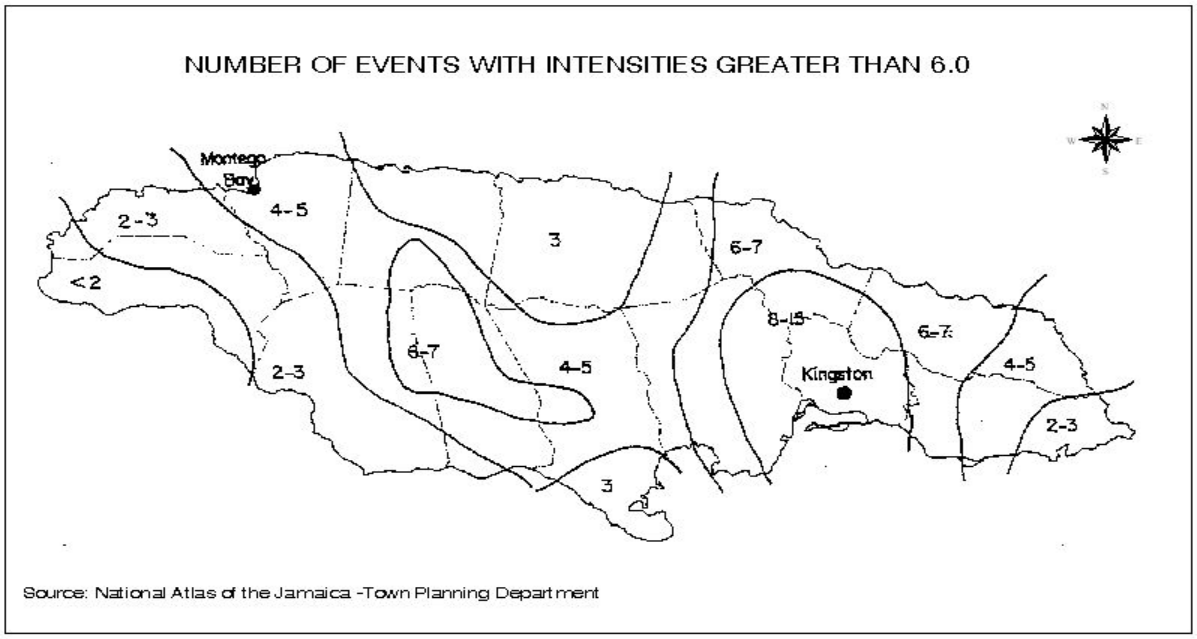
The flood risk of the Whitehall area is low and no previous incidence of flooding has been reported. There are no streams or major surface water systems located close to Whitehall. The Great Morass is to the northwest and this is drained by the North and South Negril Rivers. The South Negril River enters the Negril Bay to the west of the Whitehall Estate and is not a threat to any development that may take place at Whitehall.

Residents north of the development site when consulted indicated no major past flood events associated with drainage from the Whitehall property.

3.2.3 Earthquake Hazard

Earthquakes occur along seismically active geological faults; a north west - south east trending geological fault extends across the Whitehall property (see Map 4). A part of the fault is aligned with a major gully which drains diagonally across Whitehall property..

Jamaica is located in a seismic active zone, but the parish of Westmoreland falls outside of the major seismic risk zones (see Map 6).



Map 6 – Number of earthquake intensities greater than 6.0 in Jamaica 1879 - 1978.

3.2.4 Erosion

There is extensive fracturing of rocks close to the fault line, forming fragments of limestone mixed with reddish brown soil. The areas around the fault zone will be more vulnerable to erosion activity and slope stability problems if development is to take place in the vicinity of the fault zone.

3.2.5 Landslides

The potential for erosion especially along freshly exposed slope cut is relatively high within the vicinity of the fault zone as there appears to be no weak layers such as soft clays within the rock mass in other areas (ECOTECH, 1997). The site due to its geology is of low to moderate vulnerability from landslips along the fault line (ODPEM, 2004)

3.3 Terrestrial Environment

3.3.1 Overview of the Original Vegetation of the Life Zone

The original vegetation of the area is within the dry limestone forest zone of north-western Jamaica. The present dominant vegetation type is secondary growth scrub and dry limestone scrub forest.

Mature dry limestone forests vegetation is usually characterised by a relatively low forest canopy and tall shrubs. The Negril Hills however represent some what an intermediate state between dry forest and wet forest, what is considered Mesic Limestone Forest due to the higher rainfall, relative to other dry forest areas, received by this section of the island (Asprey and Robbins 1953). The species composition and forest structure more closely mirrors Tropical Dry Limestone Forest than any of the other major vegetation life zones present on the island. Similar to other Dry Limestone Forest areas on, there is little distinct stratification, and the forest is relatively thin. Climbing and scrambling plants are well represented. Epiphytes are restricted to xerophytic bromeliads, orchids, and cacti. A ground layer is generally absent and when present is made up of only a few species, mostly species of ferns (Asprey and Robbins 1953).

3.3.2 Method of Assessment

Sample Site

The sample sites were chosen based on the following:

- Availability of access via trails or roadways on adjoining properties (in that many sections of the study are had no direct access).

- To sample a representative area of all the observed habitat sub-types/land uses within the boundaries of the study area.

The Bird Survey

The census method used to sample the bird population was by point counts. Point counts are generally preferred in bird habitat-use studies because the habitat data can more easily be associated with the occurrence of individual birds (Bibby et al.1992). The point count results are presented in Appendix VI.

The bird census was conducted on the morning and evening of August 4th and on the morning of August 5th between the hours of 6:30 & 10 a.m. for the morning surveys, and 3:30 p.m. and sunset for the evening survey. Each point count lasted for approximately ten (10) minutes. During this period all species and numbers of individuals of each species both seen and heard were recorded.

Butterflies

Butterflies are best censused during the warmer parts of the day when they are most active. Species and their relative abundances (using the DAFOR scale of relative abundance) were recorded while walking across the study area.

Vegetational Assessment

The assessment of the vegetation was conducted on the evening of August 3rd and during the late morning and early afternoon on August 4th. Vegetational assessment was conducted by sampling plants along 15 meter transects at five (5) sites. Along each transect the vegetation within a 1.5 meter band was sampled by recording:

i. Tree species - for the purpose of this study, a tree was defined as any plant (succulent or woody) that had a diameter greater than 5 cm and measured a height of 1.4 meters above ground level (approximately shoulder level).

ii. Canopy height – the average height of the canopy was observed where there was relatively continuous canopy cover.

Tree species were identified according to Adams (1972). The relative abundance of the species observed was ranked using the DAFOR (dominant, abundant, frequent, occasional, and rare) scale of relative abundance. In addition the sub-habitats present within the study area were characterised based on an overall survey of the general study area in addition to the data from the sample locations. The results of this assessment are presented in Appendix VI.

NB. To provide an opportunity for input from the Negril Environmental Protection Trust (NEPT), Simone Williams, Manager of NEPT, and Dian Holgate, Field Officer, both participated in a very limited part of the surveys of the area. The relevant comments of these individuals have been captured in the discussion section of the report.

3.3.3 Results and Discussion

Vegetation

The survey of the area reveals that while superficially the site retains heavy vegetative cover, it has and continues to be used extensively for a range of human activities. Old concrete foundations of houses, now long destroyed, were observed on the property. In addition, the nature of the present vegetation suggests that the majority of the area had been previously clear-cut and the current vegetation had regrown and established a plant community heavily composed of non-native plant species. Extensive human impact had thereby produced a degraded ecosystem. While approximately 87% of the property was covered by woodland, none of the vegetation of the development area was natural forest. All the woodland that now covers the property was secondary growth with the majority covered by woodland in a relatively advanced stage of succession (i.e. generally larger trees). The area has retained several endemic species such as Roystonea altissima (Royal Palm/Mountain Cabbage) and Thrinax parviflora (Broom Thatch). These two species were scattered thinly throughout the development area.

Overall tree species diversity was great due to the mixture of many non-native species of trees (such as African Tulip, Logwood, Coolie Plum, Lead Tree etc.) with species more typical of this life zone. The vegetation of the study area may be categorised within three (3) broad vegetational subtypes:

Grasslands – The most northerly sections of the study area had the majority of this habitat subtype. These areas were characterized by grasses and low herb covered land (both soil and rock) sometimes shaded by scattered trees and large shrubs in some areas. This subtype has developed in the areas

that have sustained very high human activities, chief of which was cattle grazing and some burning of the land. Here the land was covered by a mixture of low herbs and shrubs, pasture weeds and many species of grasses (see also list of herbs and shrubs). This habitat subtype was also present were there was an existing squatter (person of apparently unsound mind) living on the property. In more isolated areas, small patches of this habitat subtype had developed where the land had been cleared by the removal of trees for lumber and/or charcoal burning. Grass land covered an estimated 10 -13 percent of the development area and was present both in areas with deep soil and cleared exposed white limestone rock areas.

Logwood Scrub Forest – This habitat subtype represented the vast majority of the land within the north and western sections of the study area. In this habitat type, a single species (Logwood) dominated the community, making up over 80% of the tree species. Much of this logwood forest was composed of relatively old logwood trees with a canopy of over four (4) meters. Many of these trees supported large Tilandsia bromeliads. This habitat type spreads in degraded lands in Jamaica primarily due to the abandonment of pasturelands and the propagation of the logwood plants by cattle, which are unable to effectively remove the mature saplings by browsing due to the thick thorns on the plants. The dominance of this habitat subtype in this section of the White Hall Estate is testament the extensive clearing of the land in previous years. This habitat sub-type occurred predominately where the soil was deep.

Overcut-Degraded Dry Limestone Forest – This habitat type blended in with the logwood scrub forest primarily in the more rocky areas and was only distinctive in the more southerly sections of the property. In overcut-degraded dry limestone forest the vast majority of the original native trees have been removed. This habitat is usually described as sparse woodland with a relatively low broken tree canopy including many tall shrubs with occasional tall trees rising well above the mean canopy height of the habitat. The canopy was dominated by a few large emergent tree species; Guango, Almond, Dogwood, African Tulip and Cotton Trees. Within White Hall Estate, the trees such as Guango were tall, reaching heights of over 10 meters. The spreading nature of this species (in addition to a few others) creates an effect of a lush multilayered forest. However on closer inspection it became obvious that the sub-canopy was very varied and not overall diverse in its species composition.

Due to ongoing wood harvesting, many sections of this habitat was generally difficult to penetrate. Regrowth has created an understory best described as a thicket of multi-stemmed and thin-stemmed

trees and a plethora of shrub growth in species such as Wild Rosemarie (Croton linearis). Large terrestrial bromeliads (Hohenbergia sp.) were common in this habitat growing on shaded limestone rocky outcrops.

Birds

Thirty-two (32) species of birds were observed during the point count period (see Appendix V1). Of these, ten (10) were Jamaican endemic species as listed below (see also Appendix VI):

1. Red-billed Streamertail Hummingbird
2. Jamaican Mango Hummingbird
3. Jamaican Woodpecker
4. Jamaican Pewee
5. Sad Flycatcher
6. White-chinned Thrush
7. Jamaican Vireo
8. Yellow-shouldered Grassquit
9. Jamaican Euphonia
10. Jamaican Becard

Additionally there were seven (7) Jamaican endemic sub-species of birds present as listed below:

1. Caribbean Dove
2. Vervain Hummingbird
3. Bananaquit
4. Jamaican Parakeet
5. Jamaican Oriole
6. Greater-Antillean Grackle
7. Greater-Antillean Bullfinch

Overall the area had moderate bird diversity. Based on the survey the study area supports approximately 36% of Jamaica's extant endemic bird species.

In general the Jamaican endemic species and subspecies are those of greatest conservation importance in that their entire ranges are restricted to the island of Jamaica, and many are limited in their national distributions due to their specific habitat requirements.

Of the species identified, most appeared to be well distributed within the study area. Due to the degraded nature of the habitat and tree species composition the area was not expected to be important for any of Jamaica's more sensitive endemic species, the majority of which occur preferentially in cbsed canopy well-developed forested areas. A few bird species were however restricted to one or a few areas corresponding to areas with more woodland areas such as the Jamaican Becard.

None of the species observed are currently considered to be globally threatened or endangered (Stattersfield A. J. et al. 1998). Sensitive Jamaican bird species that are known from this life zone were all absent. Their absence is most likely related to the extensive habitat degradation that already exists. Studies have shown that species composition within natural forest changes dramatically with degradation and human habitat conversion with sensitive species common to natural forest being the first to disappear (Douglas 2001).

Butterflies

Ten (10) species of butterflies were recorded from the property of which none are considered threatened (Brown 1972). See Appendix VI.

3.4 Socio-Economic Assessment

The proposed development is intended to primarily address the developmental needs of the area by providing permanent housing solutions. There is socio-economic, physical planning and spatial implications, it is, therefore, urgent that physical planning measures that integrate economic, social and environmental aspects of development within a cross-sectoral and inter disciplinary framework be implemented. This section of the report seeks to analyse plans for the proposed development and recommend measures to ensure the promotion of comprehensive sustainable social and economic community development.

The following are the main the issues relating to the development:

- The effects of the creation of residential development within the sphere of influence of Negril

- The effects of the development on existing adjacent populations
- The pending implications for social services and amenities, infrastructure and employment

3.4.1 Demographics

Preliminary Census data for 2001 for Negril indicates a total population of 5,823 up from a total of 4,841 in 1991. This represents an increase of 1,639 persons over the period. The tourist resort town, therefore, experienced a population growth rate of 39.2 per cent (see table 3). It must be borne in mind, however, that the boundary used by STATIN, does not include all the communities that fall within the Negril Environmental Protection Area nor the Negril Watershed Boundary. For example, Town Planning Department calculated the town's population in 1982 at 17,038, this was projected to 19, 911 in 1991 and was expected to grow to up to 23,696 by 2000 (TPD, 1994).

Table 3: Population Change for Negril 1991-2001

Urban Centre	Population		% Change 1991-2001	% share of total Parish Population 2001	% Share of Urban Population 2001
	2001	1991			
Negril	5,823	4,184	39.20	4.20	16.40

Source: STATIN

The census data above includes the population of the small area of the town that falls in Hanover grew from 144 in 1991 to 183 in 2001. The percentage change in Negril's population was the highest for the parish, followed by Little London (approximately 9 miles away) at 28.3%. Outside of five urban centres in St. Catherine and Ocho Rios in St. Ann this was the highest percentage population change over the period.

Mostly informal settlers occupy the area to north of the property at Nonpariel. Also further west at Whitehall a large informal settlement is now being regularized under the Operation PRIDE Programme. There are two residential developments in the construction phase at present located to the west of the development along the roadway leading to Negril. The original development was subdivided into ten (10) lots most of which will be eventually developed for residential use.

Assuming an average household size of four (4) persons the site upon completion is anticipated to have a population of approximately 788 persons

3.4.2 Housing

During the intercensal period 1982 to 1991 the housing stock in Negril grew at a faster rate than the population that was 3.8% and 1.7% respectively. The average occupancy rate therefore fell from 3.8 persons to 3.3 over the period.

The Preliminary Population Census 2001 published by STATIN revealed that the average persons per dwelling, fell from 2.9 in 1991 to 2.8 in 2001, this was well below the 2001 national average of 4.2.

Growth in the housing stock occurred mainly within central Negril between 1982 and 1991 this by 94.4%. The addition to the housing stock was mainly in the informal sector as people moved to the resort town in search of a better life. Most of the formal and informal housing activities occurred on the Whitehall property.

Low to middle income housing is the predominant types of housing solutions in the town, the Whitehall Property and Red Ground are some of the most densely populated areas in the town. The Operation PRIDE Development at Whitehall Phase II is expected to provide an additional 1,200 low to middle income housing solutions.

3.4.3 Existing Land Use

The existing land use at the proposed Whitehall property is mostly in woodland towards the south while to the north is mostly in shrubs and grass. Other land use in the vicinity of the site include mixed residential/commercial to the north of the
site which is across the road (see photos 2 & 3)

Houses on this property are located below the level of the roadway and the residents indicated that during periods of rainfall storm water flows into their yards. They, however, have not been disturbed by water in the Morass as the water recedes fairly rapidly when its water level rises.

Immediately north of the property across the main road and behind the row of informal houses lies the southern boundary of the Great Negril Morass.

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Photo 2 - Commercial activity in the form of a shop located across the road from the site.

Photo 3 – Residential settlement located across the road from the proposed development site

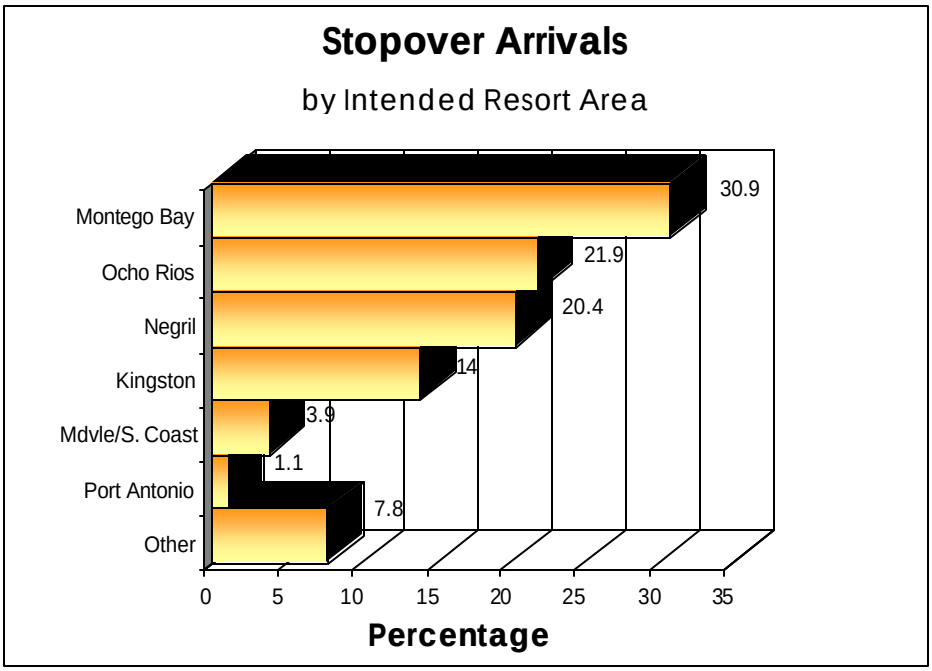
3.4.4 Zoning Regulations

There are specific development guidelines relevant only to Negril these include the under grounding of electrical lines and water pipes, single one story buildings allowed on landside and 15 habitable rooms per acre on seaward side. The proposed development was previously approved for residential development.

3.4.5 Economy/Commercial Activities

Agriculture and fishery along with tourism are the economic bases of the town. The main farming areas are to the southern, eastern and western edges of the morass where a variety of crops such as sugarcane and yam are cultivated. The project site and the areas within its immediate vicinity are not under significant agricultural production.

On the island as a whole the trend has been a steady increase in tourist arrivals. In 2002 arrivals totalled 2,131,785; an increase of 0.7 % over 2001 (PIOJ, 2003). This includes visitors in the three categories of stopover visitors, military personnel and cruise ship passengers. The contribution of Negril to the sector is significant as the town along with Montego Bay and Ocho Rios account for the



Source: Jamaica Tourist Board.

Figure 1 - Stopover arrivals from January to December 2003.

largest share of tourist arrivals on the island. In 2003 Negril had a total of 275,124 stopovers which represents the third largest market share, and 20.4% of the total number of arrivals in the island (see figure 1 below.

With respect to direct employment in tourism accommodation Negril trails behind Ocho Rios and Montego Bay.

3.4.6 Employment and Income

A market demand analysis survey in Negril in 1987 in preparation for the National Shelter Strategy indicated an unemployment rate of 27%. In the absence of specific figures for the town in 1991 the parish figures were used as indicators. The unemployment rate in Westmoreland stood at 15.5 % and 10.5% in Hanover based on information provided by the labour force survey, the national average unemployment rate stood at 15.4 %. Unemployment was estimated at 26% in 1992 when it was revealed that the rate of employment for the parish was greatest in Negril[2].

Table 4 - Total Labour Force Employed and Unemployed in Westmoreland (2003)

LOCATION	TOTAL	EMPLOYED	UNEMPLOYED	PERCENTAGE UNEMPLOYED
All Parishes	1,098,300	957,300	141,000	12.84
Westmoreland	62,600	51,400	11,200	17.9

Source: STATIN

During the construction phase, it is anticipated that several persons from the adjacent community stand to reap significant economic benefits with initiation of the construction process and the increased demand for goods and services required for the project. Transportation and food services are some of the goods and services that are anticipated to be in demand. The migrant sections of the labour force will not only need to purchase goods and services but will also require accommodation.

The commuter population is an important component of the town as it is this itinerant population that provides the labour force for the highly specialized tourism sector in the town. Workers travel daily

[2] TPD. Negril Development Plan

from communities within the parish of Westmoreland and adjacent ones such as Hanover, and St. James.

3.4.7 Social Services and Amenities Infrastructure

Within the framework for a totally integrated residential development the promotion of a harmonious integration of all sectors such as the physical, social, cultural, economical, environmental and governance systems are integral to the objective of achieving comprehensive sustainable development must be embodied in the process from its outset. In this context, the various social services are discussed below.

Fire Service

The town of Negril is equipped with a Fire Brigade Station in case of such an emergency. The station has one fire truck and one ambulance assigned to the station, and a staff compliment of four officers in total. The approximate response time in the case of an emergency would be ten minutes.

Police

The Negril Police Station serves the project area as well as several other surrounding communities within about a 7 mile radius, ranging from Bloody Bay in the north to Negril Spots in the east. Through an interview with an officer at the station it was revealed that the station presently has a work force of one hundred and four (104) officers to serve the area and two (2) patrol vehicles with which to perform such tasks. Between fifteen and thirty officers serve on a shift depending on several factors. The officer stated that the Whitehall community was patrolled at least twice per day.

Public Schools

According to the Ministry of Education, Youth and Culture School Profiles (2001 -2002) five public schools are located within the vicinity of the study area. Of these five, there is a basic school (ages 3 – 5) and a preparatory (ages 3 – 12); the remaining three are all-age schools (ages 6 – 15). Secondary level educational facilities (ages 12 – 18) are not located in or around Negril. These facilities are located in the neighbouring urban centres of Lucea, Savanna-la-mar, Frome and Grange Hill (see table 8). At the tertiary level there is UWIDITE centre located in Savanna-la-Mar. This institution offers long distance learning courses and is an extension of the University of the West Indies.

During the 2001 - 2002 academic year, the pupil: teacher ratios in most government schools within the Negril Watershed Boundary were above the set Ministry of Education standards shown below:

Infant	30:1
Primary & All-Age Schools	42:1
Comprehensive High Schools	25:1
Secondary High Schools (grades 7 – 11)	25:1
Technical High Schools	20:1
Secondary High Schools (with grades 12 & 13)	20:1

Table 5 - Public Schools that serve Negril, Westmoreland - 1998

SCHOOL LEVEL	CAPACITY	ENROLMENT	NUMBER OF TEACHERS	PUPIL/ TEACHER RATIO
Infant				
Negril Basic School	545	528	17	33:1
Primary/Preparatory				
Whitehall Preparatory	380	605	16	43:1
Sheffield All-Age	975	1,585	40	44:1
Negril All-Age	500	1,853	47	43:1
Mt. Airy All-Age	232	444	9	56:1
Comprehensive High, High & Technical High Schools				
Mannings High	1,800	1,779	90	20:1
Grange Hill	810	1,653	51	38:1
Little London	945	959	39	29:1
Frome Technical	700	1,368	62	24:1
Ruseas	1,245	1,987	80	30:1
Green Island High	1,350	1,670	64	28:1
Petersfield				
Tertiary				
UWIDITE				

* Indicates schools now on Shift System
Source: Ministry of Education, Youth and Culture

Health Services

There are no hospitals located in Negril; in order to access such services on would need to travel to the neighbouring urban centres of either Lucea or Savanna-la-mar. There are two hospitals in

Savanna-la-mar; the Savanna-la-mar hospital, which is a public hospital and the Royal Medical Hospital which is a private hospital. The Savanna-la-Mar hospital is a Type B and has a bed compliment of 200. The hospital offers in patient and out patient services in general surgery, internal medicine, obstetrics and gynaecology along with X-ray and laboratory services. The Lucea Hospital on the other hand is a Type C hospital; which operates on a smaller scale than that of the Savanna-la-mar; hospital services include general medicine, child and maternity care.

The town of Negril is however served by two health centres; the Negril Health Centre which is a Type III Health Centre that offers curative, post-natal, antenatal, family planning, child health, dental, nutrition, immunization services, treatment of common illnesses and maternal delivery services. The other is the Negril Beach Medical Centre which is privately owned.

Recreation

The Norman Manley Sea Park situated on approximately three (3) acres of land represents recreation/open space provided for residents within the town.

Post Office

Negril Post Office located on West End Road. There is no house to house delivery in the town and no major concerns.

This Post Office also offers modern services, such as, Internet access and Moneygram and the sale of telephone cards and water coupons.

Cemeteries

Negril is presently served by two cemeteries; one in Whitehall (3 acres) which is publicly owned, and the Anglican churchyard on Hermitage Road.

3.4.8 Historic and Cultural Sites

There are no sites or monuments of historic or cultural significance on the proposed development site. However, there are the ruins of the Whitehall Great House, the residence of the original property owners, which overlooks the proposed site. The Negril Royal Palm Reserve, to the north east is approximately five minutes away from the site.

The Whitehall Great House site offers an incredible view of the entire Negril beach to the Great Negril Morass and the mountains in the distance (see photo 5). The Great House was originally built and owned by Robert Parkinson in 1796. Spices, such as pimento, were grown on the property. Horses were also bred and raised on the property including the famous horse, Nonesuch.

The four hundred year-old building located originally on a 400+ acre estate is currently undergoing repair and renovations from a fire, which destroyed most of it several years ago. But, the original Italian tiles are in surprisingly good shape after 400 years. The house originally had ten (10) bedrooms, kitchens, dining rooms, and living areas. The current owner is planning on restoring it to its original condition.

Photo 4 – A section of the existing Whitehall Great House

Located within proximity of the site approximately ten minutes from Negril, just off the Sheffield to Springfield Road is the Negril Royal Palm Reserve. The reserve provides an outstanding cultural and environmental setting consisting of flora such as the Morass Royal Palms (Roystonia princeps) or Swamp Cabbage Palms as they are locally known which are endemic to south western Jamaica.

Photo 5 – View of the Negril Morass from the Whitehall Great House Property

3.4.9 Physical Infrastructure

Electricity

The Jamaica Public Service delivers power to homes and businesses across the island via 1,200 kilometres of transmission lines and 12,000 kilometres of distribution lines. The transmission system conveys electricity at high voltages from the generating plants to substations in each neighbourhood. From there, the distribution system takes electricity to the customers' doorsteps at voltages conducive to home or office equipment.

The Bogue Power Station, JPS' second largest, is located on the Bogue Industrial Estate, in the second city of Montego Bay. This station is the home of the recently commissioned 120MW combined cycle generating plant. Additionally, the station consists of five gas turbines with total generating capacity of 83.5MW. The upgraded Bogue substation ensures the relative reliability of the service and improved voltage levels.

Paradise substation provides electricity to the parish of Westmoreland through a 24KV line. It is expected that the JPSCo will provide formal electricity to the site at Whitehall.

Telephone

Cable and Wireless (Jamaica) Limited is the main provider of land telephone service, this service is available in and around Negril and would be accessible to the Whitehall community. The extension of

the service to the proposed development is within the company's capability; however, it is usually advisable to inform the company of any proposed development to ensure that it will be included in their development plans.

Digicel, Cable and Wireless and Oceanic Digital are the three companies which presently provide mobile telecommunication services to the island in general, such services of course would be a more accessible means of communication for the residents.

Potable Water Supply

This predominantly agricultural parish is recorded as having the smallest population on the island. However, it's growing tourism industry accounts for a significant transient population. The NWC operates 7 water supply systems in the region with the major one supplied by the Logwood Water Treatment Plant. This plant provides just under 60% of the parish water supply. Other systems are supplied by 4 springs and 2 river supplied treatment plants.

Located in the Logwood District of Hanover, the Logwood Treatment Plant is a full water treatment plant and is operated 24 hours daily. The treatment plant obtains water from two sources - the Blue Hole and Fish River Springs. The Logwood Treatment Plant was built in 1957, its capacity is 3.2 million gallons per day and its water supply is divided between Lucea and Negril.

The major tourist urban area of Lucea/Negril located along the west coast of the parish will be benefiting from the Lucea/ Negril Water Supply upgrading project. Work has started on this project and once completed it will increase the supply to the Lucea/Negril Area by some 4 million gallons (17 mega litres) of water per day to these areas.

It is expected that the National Water Commission through the Logwood Plant will supply potable water to the proposed development site at Whitehall.

3.4.10 Waste Disposal

Solid Waste Disposal

The Ministry of Local Government and Community Development provides reasonable services through Western Parks and Markets in the region. Solid waste is now being transported to the Retirement Solid Waste Disposal Site in Montego Bay, St. James. There are drums set up across the

road from the site to facilitate waste collection (see photo 6). Residents of the settlement stated that refuse was disposed of by burning or collection, on an average collection is twice weekly.

Photo 6 – Drums set up across the road from the site to facilitate refuse collection.

Sewage Disposal

Residents living in and around Negril utilise sewage disposal methods that include the following:

(i) Septic tank/Absorption Pit

(ii) Septic tank/Tile field

(iii) Septic tank/Tile field/Sand Filter

(iv) Linked to main sewer

(v) Informal

The National Water Commission is the primary provider of wastewater or sewage services in Jamaica and collects wastewater from over 600,000 persons across the island. As connections are made to recently completed systems in Negril, Ocho Rios, Montego Bay and sections of Kingston, the number of persons served will continue to increase.

Wastewater is collected from homes, businesses and other buildings through connecting sewer pipes called laterals. These laterals join the wastewater facilities on the private premises with those facilities

constructed underneath the public roadway. The pipes along roadways are often called main or trunk sewers and allow the wastewater to flow to the treatment facility, either by gravity or with the help of pumping stations.

There are many different ways of treating sewage but the most appropriate method for a particular area needs to be determined after careful consideration. Some of the most popular treatment methods include the use of waste stabilization ponds as well as mechanical processes that include the use of percolating filters or activated sludge.

It is expected that the wastewater generated from the proposed Whitehall development will be treated at the central disposal plant.

3.4.11 Roads, Transportation and Traffic

An upgraded road network facilitates communication with Negril by road. This coupled with an ample supply of shared taxis and minibuses ensures that communication with the resort is easy and

Photo 7 - Showing bus stop along the Nonpariel main road.

accessible. For those who wish to commute by air there is the airstrip at Rutland Point that handles domestic flights. There is need to expand the aerodrome but that might require relocating it.

Although there is no specific study by the National Works Agency of traffic generated in the vicinity of the proposed development, this Principal Road is the main thoroughfare for traffic travelling along the South Coast to and from Negril. The volume of traffic generated is consequently relatively high.

3.4.12 Health and Safety

Health and safety risks are insignificant; however, flooding of the lowlands at the northern boundary is likely without suitable mitigation measures. Run off from the property could result in flooding due to a higher water level in the Morass increase the human vulnerability factor at adjacent properties in severe rainfall events.

There is also the potential for erosion/landslips along steeper slopes.

3.4.13 Community Consultation

The Negril Environmental Protection Trust is the main environmental watchdog in Negril. Personal communication with one of the officers did not reveal any threats to Negril from the development proposed. A positive effect on the Tourism sector is the provision of additional accommodation for supervisory/management group within the town.

4.0 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 Preparation and Construction Phase

4.1.1 Impacts on Terrestrial Resources

a. Flora and Fauna

The expected change in the vegetational structure will result in the loss or near loss of all ten forest-dependent bird species shown in Appendix VI. This is therefore a direct impact in the form of loss of species. By the same token, the nature of the development will result in a significant removal and thereby loss of most of the local flora. No significant cumulative impacts (re the local flora and fauna within the development area) might be expected in the near future once the area has been cleared for development.

b. Landscaping

There can be obvious changes in species composition and distribution, habitat change/fragmentation, displacement, corridor impairment, endangered and special species. Besides its aesthetic value landscaping can create an area for translocation of fauna. Landscaping plans inclusive of the proposed replanting of trees to replace those lost by construction/clearing activities.

c. Flora and Fauna outside of the Development Area

The White Hall Estate is located within the Negril EPA. The development site is immediately across from the Negril Great Morass and Game Sanctuary (NGMGS). The northerly boundary of the development area is within 35 meters of the southern section of the NGMGS, within 800 - 900 meters of the South Negril River and within 1.5 km. of the PCJ Royal Palm Reserve. The development therefore immediately adjoins an ecologically sensitive area which contains many local and globally significant species of flora and fauna.

The potential impacts and necessary mitigation therefore needs careful consideration. In general, wetland degradation and/or destruction has severe and far-reaching impacts, including species loss, damage to fisheries and contamination of local water supplies, and wetland habitat destruction and degradation is presumed to be leading to the decline of both resident, endemic species in the area including species such as the Royal Palms of the Great Morass. Of importance, an estimated 10-15% of Jamaica's population of the globally threatened West Indian Whistling-duck (WIWD) is found with in the Great Morass, and specifically within the South Negril River section of the PCJ Royal Palm Reserve. The West Indian Whistling Duck is endangered throughout its range in the West Indies

(Bradley et al. 2001) and the Jamaican population of the species is relatively small and fragmented. Furthermore there have been concerns about the loss of flora, in particular the loss of Royal Palms in the Morass for reasons yet to be clearly understood (comment from Simone Williams, NEPT).

It cannot be overemphasized therefore the importance of preventing any development in this area from impacting negatively on the NGMGS. **(Direct, long-term impacts).**

Measures Incorporated by the Project Design and Mitigation Measures

Every attempt would be made to retain the vegetation in the northern section of the development area for:

a. Aesthetic reasons

Trees, in particular native species of palms add significantly to the ambiance of the area and further highlight the image of Negril as a natural tropical destination. Trees with important landscape and/or aesthetic value identified include the African Tulip, Cotton, and Guango and the Royal Palms. Many of these trees are also important sites for the endemic orchid *Broughtonia nigrilensis* and *Brassavola cordata,* in particular the Guango trees.

b. Flood control and soil movement

A vegetative barrier would help to contain run-off and the entry of soil among other debris into the Morass. All the larger trees of the property would be maintained intact as much as possible. The northern section of the development area is already swampy and the water-table is high in the area. There is therefore a flooding potential.

Plants with proven ability to reduce soil erosion such as Khus Khus (*Vetiveria zizanioides*) should be included in the landscaping of the property. With the clearing of the land and disturbance of the soil, materials will be easily transported down the slopes of the area, which tilts northwards towards to the Morass. Furthermore, under conditions for land clearance, construction and mining, run-off will be significantly faster and more frequent than in a natural system. *Vetiveria* would be considered to stabilize the soil banks and form an erosion barrier along the Nonpariel border of the area. This form of soil stabilisation may also be necessary on the Morass side of Nonpariel road. Other appropriate

mechanical barriers to soil and sediment movement would also be employed along the entire northern boundaries during the construction phase.

4.1.2 Impacts on the Physical Environment

a. Construction Works

This refers to the actual construction of buildings, access roads, etc. Considerable amounts of solid waste will be generated, and the natural drainage of the site patterns will be changed by the increase in impervious surfaces. Development plans for the property involves the construction of a culvert across the main road where excess runoff including from the pond will be discharged. Uncontrolled discharges entering the Great Negril Morass that could introduce pollutants and particulate material that could degrade this protected area. **(Indirect, negative, short term impact).**

Measures Incorporated by Project Design and Mitigation Measures

Good site waste management procedures as detailed below will be prepared and applied at the site. Drainage systems are designed and engineered to prevent excessive runoff of sediments. Sediment traps will be installed. Stockpiles will be contained by using sandbags and other retaining measures. The stockpiles will also be sprinkled regularly to prevent the formation of fugitive dust.

b. Air Pollution

Due to the nature of the site, levelling and the use of heavy equipment though limited would be necessary. The transportation of paving, fill and other construction material onto the site will have the negative impacts of increased incidence of noise, fugitive dust formation and accompanying disturbances to residents adjacent to the site. **(Direct, short-term, negative impact).**

Measures Incorporated by Project Design and Mitigation Measures

The institution of an appropriate schedule of activities during the construction phase will help to alleviate the impacts of increased noise, dust, etc. likely to result from construction activities. The activity schedule will be distributed to residents of the community. Additionally, construction activities will take place during periods when disturbances to the residents are minimized. Measures to reduce the formation of fugitive dust, such as sprinkling, will be instituted.

c. Geotechnical Hazard

Excavated cuts to facilitate construction of access roads and buildings are expected to be stable except where roads occur in the vicinity of the fault zone. **(Direct, long term, negative impact)**

Measures Incorporated by Project Design and Mitigation Measures

Slopes prone to slippage would be reinforced with appropriate engineering solutions using concrete or masonry as well as grassing with desirable grasses with fibrous rooting systems that inhibit soil erosion, for example khus khus.

4.1.3 Impacts on the Socio-Cultural Environment

a Solid Waste Disposal

Construction activities will lead to the generation of solid waste in significant amounts. Material produced will primarily be in the form of construction debris. Negative impacts caused at the site by waste material disposal will depend on the location of that site. The use of limestone aggregate as fill for building foundation material, will then it is imperative will require that all solid waste, including biodegradable material be removed to prevent unexpected ground settlement conditions in the fill during the construction of building structures.

Specific attention will be given to minimizing and reducing the quantities of solid waste produced during site preparation and construction.

(Direct, short term, negative impact)

Measures Incorporated by Project Design and Mitigation Measures

A waste management plan will be prepared and followed. Organic waste, namely vegetation, would be composted on site and used for soil improvement (soil conditioning) during landscaping. Branches can be put through a wood chipper to prepare soil cover for garden beds, etc. Excess inorganic waste would be stockpiled (away from drainage features) for infilling of lot sites where necessary. Adequately located and maintained temporary latrine facilities would be made available for construction workers.

To avoid the harmful effects of poor solid waste disposal at least 4 skips will be strategically placed to ensure proper disposal of the waste material, a primary concern of the development. Adequate arrangement would be made with NSWMA through WPM or with a private contractor to dispose of solid waste at the authorized dumpsite

b. Materials Transport

The transport of materials from source to site would entail use of heavy trucks, which have the potential to produce polluting gaseous emissions and dust and falling objects, depending on the material being transported. The movement of heavy trucks could also lead to additional road wear. **(Direct, short-term, negative impact).**

Measures Incorporated by Project Design and Mitigation Measures

Construction materials are typically transported in uncovered, overloaded trucks which contribute to dust pollution, increased noise, and wear and tear of the roads and risk of accidents. The contractors should ensure that trucks carrying the materials are covered with tarpaulins. Vehicles should be properly maintained and serviced to reduce emissions. The development of a transport schedule; e.g. during the off-peak hours, would also help to alleviate the effects of traffic congestion and noise.

c. Employment

The proposed project provides the opportunity for employment of construction workers and tradesmen for the duration of the construction period. Small shop owners located within close proximity of the site will also benefit along with taxi operators which may provide transportation services to off site employees. **(Direct, positive short term)**

Measures Incorporated by Project Design and Mitigation Measures

Priority will be given to residents within the immediate community for employment possibilities created during the implementation of the project.

d. Health and Safety

Increase possibilities of accidents on site as a result of trucking, construction etc. Dust pollution during construction and the effects of particulates. **(Direct, negative, short - medium term impact)**

Measures Incorporated by Project Design and Mitigation Measures

Proper signs would be erected and flagmen instituted to reduce the possibilities of accidents. Safety fences should be erected. Wearing of protective gear for workers such as dust masks and the covering of haulage trucks, dusty areas would also be sprinkled to reduce the risk of dust nuisance.

4.2 Operational Phase Impacts

4.2.1 Impacts on Hydrogeologic Resources

a. Surface Water

There exists the potential for flooding and these relate to:

1. Flooding of the site proposed for commercial use to the North.
2. Flooding of the main road due to increased surface runoff as a consequence of development.

In addition to poor site drainage to the North, it is expected that there will be a significant increase in storm water run-off during post-development phase of the project as a result of higher levels of runoff from roof of buildings and a general increase in impermeability of the site. **(Direct, negative, medium - long term impact)**

Measures Incorporated by Project Design and Mitigation Measures

The design of storm water drainage system would take into consideration estimated peak flows involving the increasing the capacity of existing natural storm drainage channels and, or adding new drains into the systems.

The shallow depressions located north of the project site serves as a detention pond by delaying peak flows into the development, resulting in changes in peak flow. It is absolutely essential to include as an option increasing the delay time for the peak flow by increasing the volume of the depression, to allow for detention of higher volumes of flood flows. Based on the location of the site and frequency of flooding in the area, a 1:50 year return period was used in the design of storm water drainage system based on data provided by the Meteorological Services.

A sustainable solid waste disposal management and public awareness and sensitization programme would be developed and implemented to promote good solid waste disposal methods in order to prevent garbage from being dumped into the surface drainage system which could disrupt the ecosystem within the Negril Great Morass.

b. Maintenance of Drainage System

Drains that are poorly maintained evidently increase the risk of flooding. This is normally the case when the drainage systems are overgrown with vegetation and/or used for solid waste disposal. **(Direct, negative, long term impact)**

Measures Incorporated by Project Design and Mitigation Measures

In this regard, a sustainable drainage maintenance programme must be developed between the stakeholders (community, developers and the Westmoreland Parish Council) to ensure that the drains are constantly cleaned, particularly before the onset of the rainy season.

4.2.2 Impacts on the Socio-Cultural Environment

a. Health and Safety

The main health and safety risks relate to access and egress to and from the project site because of the specific location along the Nonpariel main road. **(Direct, long term, negative)**

Measures Incorporated by Project Design and Mitigation Measures

Along with approval from the National Works Agency, appropriate signage and landscaping would be employed to ensure safety along to motorists and pedestrians.

4.3 Cumulative Impacts

This Negril development over time will result in a variety of changes. The most evident of these changes may be:

1. This development will see a significant change in the land cover and landscape of the area.
2. It will act as a catalyst in the growth or expansion of the town of Negril
3. The general culture of the area would shift from that of informal settlement to a more formal suburban community.
4. Apart from expansion, the town may also be faced with standard urban problems, such as crime, traffic congestion, noise, and air pollution and rural to urban migration. Management of lands within the region would also be necessary so as to avoid further growth of illegal land settlers seeking opportunities within the urban centre.

4.4 Residual Impacts

The process of planning is one which seeks to achieve the development of land through harmonious social and environmental integration. The mitigation measures put forward in this DEIA is an attempt

at further achieving such a goal. Nonetheless this development will result in changes to the environment.

There will be a general decrease in vegetation cover resulting in a slight change in the microclimate and associated wildlife at the site. The mitigation measure of re-vegetation during landscaping will not fully compensate for anticipated loss.

There will be an increase in storm water runoff that will enter the engineered drainage channels and into the South Negril River. Drains and gullies would require an ongoing maintenance programme flooding.

5.0 MANAGEMENT/MONITORING PLAN

The impacts, which require management and monitoring, are outlined below.

ACTIVITY	AGENCY/ INDIVIDUAL
PREPARATION AND CONSTRUCTIONAL PHASE	
1. a. Flood control measures - to prevent flooding of main road and commercial lot. b. Protection of adjacent wetlands and suitable engineered solutions for management of storm water, for example, the culvert across the main road. Approximate construction cost is $1,000,000,00.	Engineer/Contractor
2. Marking of trees to be maintained for landscaping.	Developer/Contractor
3. Introduction of traffic control measures, e.g. Erection of signs and use of flagmen	Developer/Contractor
4. Pollution Control: Control of fugitive dust, reducing noise nuisance, employees using dust masks etc.	Developer/Contractor
5. Obtaining construction materials from nearest legitimate sources.	Developer/Contractor
OPERATIONAL PHASE	
1. Strict adherence to the approved building plans based on the town's Building Code and approved traffic control measures from the National Works Agency.	Westmoreland Parish Council/Developer/ NWA
2. a. b. Protection of Negril Great Morass from indiscriminate disposal of solid waste	The Developer, National Water Commission Developer, Parish Council, NRCA
3. Education of residents and haulage contractors on the importance of proper waste management practices	National Solid Waste Management Authority, Developer
4. Emergency Management Plan and Education	Westmoreland Parish Council
5. Institute penalties for the indiscriminate removal/cutting of tree species.	NEPA/The Developer

6.0 REGULATORY AUTHORITIES AND LEGISLATION

The regulatory frameworks within which the proposed project to be developed are addressed below. The areas of relevance concern environmental quality, health and safety, protection of sensitive areas, protection of endangered species, site selection and land use control at the regional, national and local levels that relate to or should be considered within the framework of the project.

6.1 Regulatory Authorities

6.1.1 The National Environment and Planning Agency

Under the Natural Resources (Permits and Licenses) Regulations of 1996, the National Environment and Planning Agency (NEPA) are responsible for environmental protection on the island. In discharging its responsibilities, NEPA not only responsible for the environmental protection but also manages the nation's natural resources and the enforcement of environmental and development planning laws. Its functions include ensuring that developments are undertaken within its environmental guidelines by requiring environmental impact assessments, reviewing proposed developments and granting permits and licences.

Besides the NRCA Act, NEPA monitors and enforces laws and regulations such as The Beach Control Act, The Watershed Protection Act and the Wildlife Protection Act.

6.1.2 The Town and Country Planning Authority

This development falls under the Town and Country Planning Act of 1958 (amended 1993 and 1999) and the Local Improvements Act of 1944. The guidelines of the Westmoreland Development Order (1978) should generally be adhered to. These statutes control the development and subdivision of land. In such cases, normal procedures for building and development applications would be pursued by being channelled through the Westmoreland Parish Council and NEPA respectively.

6.1.3 The Ministry of Health

The Environmental Health Unit (EHU) of the Ministry of Health is the agency responsible for the approval of the proposed sewage treatment and disposal system and setting the discharge limits.

6.1.4 Ministry of Transportation and Works

The Ministry of Transportation and Works requires that the drainage and road design meet its approval.

6.1.5 National Water Commission

The National Water Commission is responsible for potable water supply and sewerage services.

6.1.7 Water Resources Authority

This government Agency is responsible for the monitoring and ensuring the proper use of the surface and ground water resources of the island.

6.1.8 The Westmoreland Parish Council

The Westmoreland Parish Council has responsibility for the provision of certain public services including public health, fire protection, abattoirs, cemeteries, street cleaning, parks and play fields and markets. The Parish Council is also responsible for solid waste disposal but Western Parks and Markets are managing this.

6.1.9 The Negril and Green Island Area Local Planning Authority

Since September 1, 1998 all development plans were required to meet standards that are set by the Town and Country Planning Negril Green Island Development Order and managed by this Authority.

6.2 Relevant Legislation

Legislation relevant to the establishment of a residential/commercial development in Westmoreland is outlined below.

6.2.1 The Natural Resources Conservation Authority (NRCA) Act (1991)

The NRCA Act (1991) is the overriding legislation governing environmental management in Jamaica. It requires that all new developments (or expansion of existing projects) which involve the sub-division of more than ten (10) lots be subject to EIA

The regulations require that eight (8) copies of the EIA Report be submitted to the Authority for review. Therefore a preliminary review period of ten (10) days is required to determine whether additional information is needed. After the initial review, the process can take up to ninety (90) days

for approval. If on review and evaluation of the EIA the required criteria are met, a permit is granted. In the event that the EIA is not approved, there is provision for an appeal to be made to the Minister.

Specifically, the relevant section(s) under the Act that addresses the proposed project are:

Section 10: Empowers the Authority to request EIA's for the construction of any enterprise of a prescribed category.

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

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

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

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

- performance of the facility
- quantity and condition of the effluent discharged
- the area affected by the discharge of effluent

6.2.2 Town and Country Planning Act (1958)

Section 5 of the Town and Country Planning Act authorizes the Town and Country Planning Authority to prepare, after consultation with any local authority, the provisional development orders required for any land in the urban or rural areas, so as to control the development of land in the prescribed area. In this manner, the Authority will be able to coordinate the development of roads and public services and conserve and develop the resources in the area. Any person may, under Section 6 of the Act, object to any development order on the grounds that it is:

• impractical and unnecessary;

• against the interests of the economic welfare of the locality.

However, if the Minister is satisfied that the implementation of the provisional development order is likely to be in the public interest, he may, under Section 7 (2) of the Act, confirm it with or without modification by publishing a notice in the Gazette. Section 8 of the Act also gives the Minister the authority to amend a confirmed development order.

Section 10 of the Act states that a development order must include:

- clearly defined details of the area to be developed;
- regulations regarding the development of the land in the area specified;
- formal granting of permission for the development of land in the area.

If the provisions of section 9A of the Natural Resources Conservation Authority (NRCA) Act apply to the development, the application can only be approved by the Planning Authority after the NRCA has granted a permit for the development. (Section 11 (1A).

The Authority may impose a "tree preservation order" under Section 25 of the Act if it considers it important to make provision for the preservation of trees and woodlands in the area of the development.

6.2.3 Land Development and Utilization Act (1966)

Under Section 3 of the of the Land Development and Utilization Act (1966), the Land Development and Utilization Commission is authorized to designate as agricultural land, any land which because of its "situation, character and other relevant circumstances" should be brought into use for agriculture. However, this order is not applicable to land, which has been approved under the Town and Country Planning Act for development purposes other than that of agriculture. Among the duties of the Commission outlined in Section 14 of the Act is its responsibility to ensure that agricultural land is "as far as possible, properly developed and utilized".

6.2.4 Registration of Titles Act (1989)

The Registration of Titles Act of 1989 is the legal basis for land registration in Jamaica, which is carried out using a modified Torrens System (Centre for Property Studies, 1998). Under this system, land registration is not compulsory, although once a property is entered in the registry system the title is continued through any transfer of ownership.

6.2.5 The Watershed Protection Act (1963)

This Act governs the activities operating within the island's watersheds, as well as protects these areas. The watershed designated under this Act is the South Negril Orange River Watershed Management Unit.

6.2.6 The Public Health Act (1974)

This Act falls under the ambit of the Ministry of Health (MOH). Provisions are also made under this Act for the activities of the Environmental Health Unit (EHU), a division of the MOH. The EHU has no direct legislative jurisdiction, but works through the Public Health Act to monitor and control pollution from point sources. The Central Health Committee would administer action against any breaches of this Act. In addition, there are various sections of this legislative instrument that govern and protect the health of the public. Relevant sections under the Public Health Act of 1985 are:

Section 7 - (1) A local Board may from time to time, and shall if directed by the Minister to do so, make regulations relating to nuisances and,

Section 14 - (1) The Minister may make regulations generally for carrying out the provisions and purposes of this Act, and in particular, subject to Section 7 but without prejudice to the generality of the foregoing, may make regulations in relation to air, soil and water pollution.

6.2.7 The National Solid Waste Management Act (2001)

The Regulatory Agency, the National Solid Waste Management Authority will be responsible for the implementation of the National Solid Waste Management Act.

In Part II Section 4-1 the Authority shall –

(a) Take all such steps as are necessary for the effective management of solid waste in Jamaica in order to safeguard public health, ensure that waste is collected, stored transported, recycled, reused or disposed of, in an environmentally sound manner and promote safety standards in relation to such waste;"

In Section 23 – (i) Every person who:

a. Operates or propose to operate a solid waste disposal facility:

b. Provides or proposes to provide solid waste collection or transfer service; or

c. Otherwise manages solid waste, "Shall apply in the prescribed form and manner to the authority for the appropriate licence."

Part V Section 42 – (i) 7.The Authority may provide the occupier of any premises, on his request, with receptacles to be used for:

a. Compostable waste which is to be recycled

b. Non - compostable waste which is to be recycled; or

c. Waste which is not to be recycled"

Subject to subsection (4), the Authority may, in relation to a request for receptacles:

a. Where possible, provide them free of charge; or

b. Provide them at such cost, and on such terms as to payment, as may be agreed with the occupier.

Part VII Section 45 - Every person who -

a. Disposes of solid waste in any area or in any manner not approved by the authority;

b. Operate a solid waste disposal facility, provide solid waste collection or transfer service or otherwise manages solid waste, without a valid licence or operating certificate under this Act or any regulation hereunder; commits an offence and shall be liable on summary conviction before a Resident Magistrate to a fine not exceeding one million dollars or to imprisonment for a term not exceeding nine months or to both such fine and imprisonment.

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APPENDICES

I TERMS OF REFERENCE

II TEAM MEMBERS

III NEPA LETTER – APPROVAL OF TERMS OF REFERENCE

IV NSWMA LETTER – REQUIRED ACCOMODATONS FOR SOLID WASTE COLLECTION

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I TERMS OF REFERENCE

TERMS OF REFERENCE FOR ENVIRONMENTAL IMPACT ASSESSMENT FOR A PROPOSED DEVELOPMENT - PART OF WHITEHALL, NEGRIL, WESTMORELAND

1. Introduction

The introduction will describe in general terms the reason for the Environmental Impact Assessment, the guidelines prepared by the National Environment and Planning Agency and a synopsis of the development will also be included in this section and the location where the report will be made available for viewing.

2. General description of the project including:

- maps, design plans and photographs both aerial and land based
- purpose and justification
- history of the project and project area
- alternatives to the proposed project
- how the project relates to the existing conditions
- public utility requirements - sewerage, water, electricity in short to long term
- site preparation
- scheduling of development activities, methods, materials
- waste disposal associated with the project
- habitat considerations – need for translocation of site fauna species

3. Detailed description of the Physical and Biological Environments and a limited description of the Socio-cultural Environment

a. Besides the following, information on the physical environment would be examined based mainly on rainfall, temperature, prevailing winds, soils, hydrology and topography:

Hydrology	-	Flooding history, rainfall, drainage
Geology	-	Lithology, faults, landslides etc.
Groundwater	-	Levels, quality, flow direction etc.

Water Supply - Demand Balance Analysis

Water demand for the general area will be assessed based on population data and consumption rate for the various demand sectors (domestic, industrial and agricultural) in the general area. The present and projected water demand will be compared with the existing supply in the general area. The result of this analysis will determine the additional quantity of water required. Potential sources of potable water supply will be identified, stating their availability and constraints. As such corresponding letters would be included in the appendix.

Storm Water Runoff

Storm water runoff to and from the site will be assessed using the Rational Method. Storm water runoff will be assessed for return periods of 5, 10 and 25 years in order to provide information useful in the engineering design of hydraulic structures (drains, culverts etc) on and adjacent to the site. As such the plan would be submitted to the National Works Agency for approval of the proposed action. The subsequent response will be included in the appendix.

Surface Water

Identification and assessment of surface water sources, such assessment will include drainage patterns, risk and history of flooding.

Groundwater and Surface Pollution Risk Analysis

The risk of groundwater pollution as a consequence of the development will be assessed based on analysis of groundwater depth, lithology and percolation rate. The effects of Runoff on the Great Morass will be presented.

b. An ecological assessment of the existing natural communities found at the proposed site of the proposed subdivision will be conducted. The study will compile ecological data by characterizing the major ecological community types

Survey of Flora

This will include a vegetation survey and analysis inclusive of a map showing those trees that are to be retained. Field investigations will include community structure, primary and secondary human disturbances and flora identification. Community classifications will be based on the dominant plant types and substrates that compose them. Plant species will be identified in the form of a species list where possible; any alien invasive species of plants found will be clearly identified.

Survey of Fauna

The fauna will be surveyed by either direct observation or searching for indicators, such as burrows, tracks, and observation of the general area. Species and indicators encountered on the site proposed for development will be reported. The physical and vocal characteristics of avifaunal species, which cannot be immediately identified, will be described in detail; and verified. Species of economic importance will also be identified.

c. Socio-cultural Environment

The socio-cultural environment will be studied based on:

- Aesthetics – short to long-term sensory effects to residents
- Public Facilities and Services – roads, traffic, utilities and social services
- Public Health and Safety – the identification of risks and their assessment as they relate to the project and the management of any risks, such as flooding, that may affect residents
- Sewage disposal options
- Effects on the local economy e.g. the tourist industry
- Effects of the development on the local population
- Cultural resources – A historical study of the area will identify resources to be protected.
- Community perception and concerns with regards to the proposed development.

A survey will be conducted of adjacent areas to determine land management practices such as compatible and incompatible uses and existing and proposed uses. The project

will be analysed under the guidelines of the Town and Country Planning Act (1958). Cultural practices will be investigated.

Waste Disposal

The preferred method, level and location of sewage treatment and disposal chosen will be stated in the report. The chosen method of sewage treatment will be assessed based on layout and design with a view of determining the capacity of the existing facility and its ability to effectively handle the volume of effluent the proposed development will produce. It is proposed that the treatment facility will be off site, hence authorization will be sought and the relevant approval letters from the National Water Commission will be included in the appendix.

Solid waste disposal methods both during construction and operation will be examined to determine sustainable practices. Confirmation will be sought from the National Solid Waste Management Authority of the local entity's ability to assure the collection of solid waste after full development. Such response will also be included in the appendix.

4. Potential Environmental Impacts and Mitigation Measures

Any impacts (including triggering impacts) to the ecosystem components as a result of the project during the construction and the operational phases will be noted and mitigation measures recommended where necessary. These impacts and those off-site will be quantified where possible.

The identification of impacts will focus on the following areas:

a. Wildlife (avi-fauna) and vegetation - any obvious change in species composition and distribution, habitat change/fragmentation, displacement, corridor impairment, endangered and special species.
b. Landform – physical changes, for example features of special interest.
c. Pollution – pollution of groundwater and its potential impact on the nearby Great Morass. Activities that will trigger pollution will also be included.
d. Flooding and drainage considerations including the potential impact on the natural drainage and the minimization/reduction of sheet flow of water from the site to the nearby adjacent properties and Great Morass.
e. Waste Disposal – solid waste disposal and sewage disposal methods.

f. Landscaping – effects of landscaping on flora and fauna e.g. the need for creating an area for translocation of fauna. Landscaping plans inclusive of the proposed replanting of trees to replace those lost by construction/clearing activities.

Impact mitigation will focus on design elements, alternative construction techniques and long-term operational practices, as well as, whether impacts are direct or indirect. An analysis of proposed mitigatory measures for each potential impact, preferred alternative(s), and the various costs along with preferred alternative(s) and suitable justification.

Cumulative Impacts - Changes within the area over time because of the project along with those being experienced from existing site activities would be noted.

Residual Impacts - Given the mitigation measures recommended, environmental changes that may result from project implementation would be described.

5. Identify the Legislative and Regulatory Framework

The relevant regulations, local and national government agencies, and their roles concerning the project permit and approval requirements will be identified.

Legislation such as:

- Natural Resource Conservation Act, NRCA (1991)
- Watershed Protection Act (1963)
- Public Health Act (1974)
- National Solid Waste Management Act (2000)
- Town and Country Planning (Negril & Green Island Area) Provisional Development Order (1981)

Authorities such as:

- National Environment and Planning Agency
- Ministry of Transport and Works
- National Water Commission
- Water Resources Authority
- Negril/Green Island Land Planning Authority
- The Negril Area Environmental Protection Trust

- Westmoreland Parish Council
- Office of Disaster Preparedness and Emergency Management

6. Public Community Participation

Local stakeholders will be interviewed in order to facilitate community inputs in the process.

7. Monitoring and Management Plan

Areas for monitoring during and after the construction phase will be identified. Follow-up activities will be recommended where necessary. The responsible persons/agencies will be identified.

II TEAM MEMBERS

a. TEAM LEADER – PROFESSIONAL PROFILE

Beverline Brown Smith MURP, BA (Hons), Dip. Management of the Environment

Beverline Brown Smith, Principal Consultant and President of EPN Consultants Limited, has over twenty years experience as an Environmental Planner completing over forty (40) projects.

She graduated from the University of the West Indies Mona and the University of Guanajuato, Mexico.

Her earlier professional years were spent at the Town Planning Department (now part of the National Environment and Planning Agency, of the Ministry of Land and Environment).

During that period she worked on a number assignment, including:

- Development Plans for Morant Bay and Port Maria
- Updating of the National Atlas
- A Retail Trade Survey

In October 1986 she resigned as a Physical Planner from the Town Planning Department and pursued a dual career, as an Environmental Planner and a Financial Consultant, subsequently establishing EPN Consultants Limited in 2001. As Principal Consultant of the Firm she assumes the lead role participating in and co-ordinating all project activities including being the author of approximately thirty (30) Environmental Assessments and Socio-economic Impact Assessments.

In 1980 she became a member of the executive council of the Town and Country Planning Association (now Jamaica Institute of Planners) rising to the position Treasurer and then to Vice President in 1984.

Beverline has continually improved her technical skills and competence by participating in training courses both locally and overseas, for example:

- Certificate in Risk Management in Community Development Planning from SSPA/Sida , Gotenburg, Sweden in 2000

- Certificate in Entrepreneurship and Job Creation from the Maastricht School of Management, the Netherlands and the Universidad del Pacifico, Lima, Peru in 2000.
- Diploma in Environmental Management from the Maastricht School of Management (RVBMSM), the Netherlands in 1994

b. ECOLOGIST

Leo Douglas B.Sc. (Hons.), M.Phil,

Thanks also to Mr. Basil Fernandez, BSc of the Water Resouses Authority for his insight on the Hydrogeology of the proposed development site.

III NEPA LETTER – APPROVAL OF TERMS OF REFERENCE

Ref. No. 2003-10017-EP00167

June 30, 2004

Mr. Cosmo Whyte
Cosmo Whyte Architect Limited
Shop # 8
Freeport Shopping Centre
Montego Bay
St. James

Dear Sir:

Re: Terms of Reference for an Environmental Impact Assessment for a Proposed Development at Part of Whitehall, Negril, Westmoreland

The Terms of Reference (TORs) submitted by your consultants - EPN Consultants Limited have been reviewed by this Agency. Please note the following amendments that need to be made to the TORs.

1. The Office of Disaster Preparedness and Emergency Management (ODPEM) should be consulted for their comments, especially pertaining to the fault line that traverses the property (page 1 of the TORs – Geology).

2. The National Solid Waste Management Authority should be consulted to assure the collection of solid waste before, during and after construction, and not just after full development (page 3 of the TORs).

3. Cultural and archaeological resources should be identified.

4. When considering the potential environmental impacts and mitigation measures, under pollution, please include air pollution, such as dust, and noise pollution (page 4, point 'c' - pollution).

5. As the site is located within a protected area, the specific sensitivities of the protected area should be highlighted.

6. The carrying capacity of the proposed site should be included in the EIA.

7. The mitigation measures should quantify and assign financial and economic values to the various mitigating methods chosen.

8. Project activities and impacts should be represented in matrix form with separate matrices for construction and operation.

9. The examination of the Legislative and Regulatory Framework should also include Building Codes and Standards.

Kindly make the above-mentioned adjustments to the TORs. The TORs dated May 2004 are hereby approved with the inclusions of this letter.

Please be reminded that all findings must be presented in the EIA report and must reflect the headings in the body of the TORS, as well as references. Eight (8) hard copies and an electronic copy of the report should be submitted. The report should include an appendix with items such as maps, site plans, the study team, photographs and other relevant information.

Kindly do not hesitate to contact the undersigned or Mrs. Michelle Hamilton-Sucklal if you require any further clarification.

Yours sincerely,

(for) Michelle Hamilton-Sucklal
Krishna Desai
for Chief Executive Officer

c.c. Mrs. Beverline Brown-Smith – EPN Consultants Limited
Mr. Neville Daley - Neville Daley and Company Limited

IV NSWMA LETTER – REQUIRED ACCOMODATONS FOR SOLID WASTE COLLECTION

National Solid Waste Management Authority

(An Agency of the Ministry of Local Government, Community Development & Sport)

61 Half Way Tree Road, Kingston 10 Telephone: (876) 960-4511 • 968-6160 • 926-3988 • 926-8559 • 926-5170 Fax: (876) 920-1415
E-mail: nswma@nswma.gov.jm

September 17, 2004

Mrs. Beverline Brown – Smith
President
EPN Consultants
831/2 Red Hills Road
Suite # 7, Main Plaza
Kingston 20

Dear Mrs. Brown-Smith

Re: Provision of Solid Waste Services for the Proposed Subdivision – Part of Whitehall Estate, Negril, Westmoreland

The NSWMA acknowledges receipt of your correspondence requesting an indication of its ability to conduct solid waste collection services at the proposed subdivision of Whitehall Estate, Negril. The Authority conducts collection in subdivisions and approves of the accommodations made for solid waste collection if the structure of the development is compatible with the attached criteria.

Until the development is listed on the property tax roll, the cost for solid waste collection services of the residential lots is $3066.00 per household per annum, thus a total of $429,240.00 for the 140 households annually. If communal skips are required, rental is $28,800.00 per skip annually and $350.00 per clearance of the skips.

Please feel free to contact the undersigned should you have any further queries.

Yours sincerely,
NATIONAL SOLID WASTE MANAGEMENT AUTHORITY

B. Morgan
Bethune Morgan
Planning and Research Manager

*hs

c. Mr. Percival Stewart, Regional Operations Manager, WPM.

NSWMA – Keeping Jamaica Clean & Beautiful

September 17, 2004

Re: Provision of Solid Waste Services for the Proposed Subdivision – Part of Whitehall Estate, Negril, Westmoreland

CRITERIA FOR SOLID WASTE COLLECTION

Containerization

- **Household** - Covered receptacles not exceeding US 55 gals. Metal drums or covered mesh bin(s) per dwelling housing bagged waste.
- **Communal** – Capacity should not exceed 8 cu. yd., for eg. Metal skips.

Accessibility of Solid Waste Receptacles

- Capability of strategic placement of individual receptacles in front of the respective premises.
- Centrally located communal receptacles of no hindrance or nuisance to pedestrian traffic or residents.
- Accessibility of receptacles by the NSWMA collection crew 24 hours on collection days

Physical Requirement to Accommodate Collection Units

- **Minimum Road Width** - 8.2 ft. / 2.5 metres
- **Turning Radius** - 70 ft./ 21.35 metres

V ODPEM – HAZARD ASSESSMENT REPORT

OFFICE OF DISASTER PREPAREDNESS AND EMERGENCY MANAGEMENT
12 Camp Road, Kingston 4, Jamaica, W.I., Tel: (876) 928-5111-4, Toll Free: 1-888-991-4262
Tel/Fax: (876) 928-5503, E-mail: odpem@cwjamaica.com, Website: www.odpem.org.jm

Reference Number: TPDCG/129

September 29, 2004

Mrs. Beverline Brown Smith
President
EPN Consultants Limited
Suite #7
Main Plaza
83 ½ Red Hills Road
Kingston 20

Dear Mrs. Brown Smith

RE: SUB-DIVISION REPORT FOR PART OF WHITEHALL ESTATE, NEGRIL, WESTMORELAND

Please see the attached report of the subdivision application for the above captioned.

With kind regards.

Yours sincerely,

Mrs. Joe-ella Mitchell
Senior Director, MPRD (Acting)
For the Director General

This report is based on a desk analysis. No site visit was carried out

HAZARD ASSESSMENT REPORT

Address: Part Of White Hall Negril
Applicant: EPN Consultants Limited

Proposal

The proposed development would be to divide 21.87 hectares of land into 140 residential lots, 2 for open space, 1 for commercial use and the remainder for hydrological utilities.

Location

The community for proposed development is located in the community of White Hall in Negril, Westmoreland. The community profile is typified by residential land use, some of which is emerging.

Geology

The proposed subdivision is located on the Gibraltar-Bonny Gate Formation of the White Limestone Group traversed by an 'inactive fault'. Characteristically this rock-type varies between soft chalks, shelly carbonate limestones, clayey and iron rich limestones or soft to hard rubbly limestones. These dependent on the frequency of faults in the area while rocks might contain hard fine-grained micrite minerals.

Under the influence of rock movement, the rock-type is capable of developing steep sided, extensive flat top mountains/hills (plateaus/horsts). This rock type in conjunction with faulting (natural breaks in rock body) and sinkholes and depressions created due to its carbonate nature, can develop well-defined underground drainage systems (Karstic Features). Surface drainage can also be fault controlled.

Permeability in the Bonny Gate Formation is generally low through pores (primary) and can be very high through cracks and fissures (secondary).

Slopes on this rock-type generally have moderate slope stability which is dependent on soil strength, particularly in depressions. The Bonny Gate Formation has a reasonably good bearing capacity of 4000 KN/m^2, and dependent on clay content. Soils on this formation have a bearing capacity ranging between 40 – 500 KN/m^2.

Hazard Assessment

The proposed site under review is vulnerable to the usual hazards of hurricanes, earthquakes, and other effects associated with meteorological activity. The property is located on land as high as 125ft above sea level, sloping in a northerly direction. The site due to its geology is of low to moderate vulnerability from landslips along the fault line. Structures constructed on this subdivision despite the reasonably good bearing capacity of the rock type face added risk from differential settlement in the event of seismic hazards. This due to the possibility of clay lenses and caves in the bedrock. Seismic hazards will be intensified along the fault line.

Drainage on this particular proposal is controlled by the Fault trending North-West /South-East which can potentially lead to excessive channel flow and further flooding of adjacent lots during sustained meteorological activity, this especially so since the area is located in the vicinity of Negril; a community which is listed on the ODPEM's list of High Risk Flood Prone Areas. Evidence of poor drainage in surrounding areas such as ponds and swamplands along with the occurrence of depressions can strongly bolster the flooding potential in the area. However engineered drainage works should adequately cater to seasonal floods.

Possible construction problems

- Depth to bed rock extremely variable
- Collapse into underground caves
- Flood risk in depressions and gullies
- Landslip risk along fault lines

Recommendations

The CDPEM offers no objection in principle to the proposed development, however it is recommended that the following conditions be met:

1) Implementation and maintenance of proper storm water drainage system to the design specifications of the National Works Agency. This in order to minimize the effects of storm water runoff on communities at lower elevations and the main road adjacent to site.
2) Ensuring that all structures adhere to the design specifications as set out in the National Building Code of Jamaica. This in order to minimize risks associated with seismic occurrences.

Reference:

- CDPEM List Of High Risk Areas
- C' Hara M., Bryce R., *A Geotechnical Classification Of Jamaican Rocks*
- Jamaica Geological Sheet 1 (1:50,000); ref: GSD B 138

VI BIOLOGICAL SURVEY DATA

	BIRDS	Points at which surveys were conducted																
	Common Names	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Number of ind. of species**	**% of points at which species was observed**
1	Cattle Egret	1															1	7%
2	Red-tailed Halk						1										1	7%
3	American Kestrel	1				1										1	3	20%
4	White-crowned Pigeon	1		1			3	1	1	1			4	1			13	53%
5	Common Ground Dove		1				2				1	2			1	1	8	40%
6	Caribbean Dove				1		1						2				4	20%
7	White-winged Dove							1		1					2	1	5	27%
8	Mangrove Cuckoo			1							1						2	13%
9	Smooth Billed Ani				1								1			1	3	20%
10	Green Rumped Parrotlet							2						3	3		8	20%
11	Jamaican Parakeet											4			1		5	13%
12	Vervain Hummingbird	1							1		1	2				1	6	33%
13	Red-billed Streamertail Hummingbird	1	1	1		1				1			1	1			7	47%
14	**Jamaican Mango Hummingbird**								1		1						2	13%
15	**Jamaican Woodpecker**			1			1	1		1	2			2	1		9	47%
16	**Jamaican Pewee**												1				1	7%
17	**Sad Flycatcher**								1		1				1		3	20%
18	Gray Kingbird									1					1		2	13%
19	Loggerhead Kingbird			1					2					1			4	20%
20	**White-chinned thrush**		2					1			1	2	1	2			9	40%
21	Northern Mockingbird	3			2	1				1						1	8	33%
22	**Black-whiskered Vireo**	1			1			1		1		1			2		7	40%
23	**Jamaican Vireo**		3		1	3	1			2			2		1	1	14	53%
24	Northern Waterthrush				1												1	7%
25	Bananaquit	3	2	1			1	1		2			1	1	2	1	15	7%
26	Antillean Palm Swift			2		2			3			2		1			10	67%
27	**Yellow-shouldered Grassquit**					2			1				1				4	20%
28	**Greater-Antillean Bullfinch**		2		1			1			1				1		6	33%

29	Jamaican Euphonia			1	2			1				1	1	1			7	40%
30	Yellow-faced Grassquit					1			1					2			4	20%
31	Greater- Antillean Grackle		1							2	1	1				1	6	33%
32	**Jamaican Becard**												1				1	7%
32	**Jamaican Oriole**							1						1	1		3	20%
	Total # of Individuals by point	**12**	**12**	**9**	**10**	**11**	**10**	**11**	**11**	**13**	**10**	**15**	**16**	**16**	**17**	**9**	182	
	Total # of species by point																	

Forest dependent species shown in bold.

BIRDS STATUS

	Common Name	Scientific Name	Local Name	National Status
1	Cattle Egret	Bubulcus ibis	Ticks Bird or Gaulin	R1
2	Red-tailed Halk	Buteo jamaicensis	Chicken Halk	R1
3	American Kestrel	Falco sparverius	Lizard Hawk or Killy-Killy	R1
4	White-crowned Pigeon	Columba leucocephala	Ball Plate	R1
5	Common Ground Dove	Columbina passerina	Ground Dove	R1
6	Caribbean Dove	Leptotila jamaicensis	White-belly	R1
7	White-winged Dove	Zenaida asiatica	White-wing	R1
8	Mangrove Cuckoo	Coccyzus minor	Rain Bird	R2
9	Smooth-billed Ani	Crotophaga ani	Savanna Blackbird	R1
10	Green Rumped Parrotlet	Forpus passerinus	Parakeet	I1
11	Jamaican Parakeet	Aratinga nana	Parakeet	R1
12	**Jamaican Mango Hummingbird**	Anthracothorax mango	Mango Hummingbird	E2
13	Vervain Hummingbird	Mellisuga minima	Little Doctorbird	R1
14	**Red-billed Streamertail**	Trochilus polytmus	Doctorbird	E1
15	**Jamaican Woodpecker**	Melanerpes radiolatus	Woodpecker	E1
16	**Jamaican Pewee**	Contopus palidus	Pewee	E1
17	**Sad Flycatcher**	Myiarchus barbirostris	Little Tom Fool	E1
18	Gray Kingbird	Tyrannus dominicensis	Pitchary	S1
19	Loggerhead Kingbird	Tyrannus caudifasciatus	Loggerhead	R1
20	Northern Mockingbird	Minus polyglottos	Nighting Gale	R1
21	**White-Chinned Thrush**	Turdus aurantius	Hopping Dick	E1
22	**Jamaican Vireo**	Vireo modestus	Sewi-sewi	E1
23	*Northern Waterthrush*	*Seiurus noveboracenis*		W1
24	Bananaquit	Coereba flaveola	Yellow-belly	R1
25	Antillean Palm Swift	Tachornis phoenicobia	Swallow	R1
26	**Yellow-shouldered Grassquit**	Loxipasser anoxanthus	Squit or Yellow-back Grasssquit	E2
27	Greater Antillean Bullfinch	Loxigilla violacea	Black Sparrow	R1
28	**Jamaican Euphonia**	Euphonia jamaica	Cho-cho Quit	E1
29	Yellow-faced Grassquit	Tiaris olivacea	Squit or Grassquit	R1
30	Greater Antillean Grackle	Quiscalus niger	Cling-cling	R1
31	**Jamaica Becard**	Pachyramphus niger	Rickatee or Kissidy	R2
32	Jamaican Oriole	Jamaican Oriole	Banana Katie	R1

Key:

R - Resident; **E** - Endemic;
I - Introduced; **S** - Summer Migrant
W - Winter Migrant
N.B. Endemic species shown in bold.

1 - Common in suitable habitat
2 - Uncommon

RELATIVE ABUNDANCE OF BUTTERFLY SPECIES OBSERVED WITHIN THE STUDY AREA

Butterfly Species	Relative Abundance (DAFOR)
The Zebra Butterfly *Heleconius sp.*	D
The Mosaic *Colobrua dirce*	O
Antillean Malachite *Siproeta stelensis*	O
Citrus Swallowtail *Papilio therstes*	O
White Peacock *Anartia jatrophae*	R
Sulphur Butterfly *Eurema sp.*	R
Buckeye *Junonia coenia*	R
Jamaican Ringlet *Calisto zangis*	R
Long-tailed Skipper *Choides sp.*	O
Julia *Dryas iulea delita*	O
Little Blue *Brephidium sp.*	O

DESCRIPTION OF VEGETATION BY TRANSECT

Transect 1

Overall Habitat Description: Open Grassland with Scattered Trees. Many shrubs common including: Madam Fate (*Hippobroma longifolia*), Shame Weed (*Mimosa pudica*), Carpet Daisy (*Wedelia trilobata*) and Broomweed (*Sida acuta*). Many species of grasses present.

Numbers of trees along transect: 3

Average canopy height: There was no continuous canopy in the area.

Common Name	**Scientific Name**	DAFOR
Logwood	*Haematoxylum campechianum*	O
Bastard Cedar	*Guettarda elliptica*	R
Trumpet Tree	*Cecropia peltata*	R

Transect 2

Overall Habitat Description: Old growth logwood scrub. A pure stand of logwood trees. The trees were on average approximately 8-12 cm. in diameter at shoulder height. There were few plants under the canopy. The trees however had numerous *Tilandsia* bromeliads in their branches.

Numbers of trees along transect: 21

Average canopy height: 5.5 meters

Common Name	**Scientific Name**	DAFOR
Logwood	*Haematoxylum campechianum*	D

Transect 3

Overall Habitat Description: Degraded dry limestone forest with scattered *Cecropia* trees.

Numbers of trees along transect: 12

Average canopy height: 8

Common Name	Scientific Name	DAFOR
Maiden Plum	*Comocladia spp.*	O
Dogwood	*Piscidia piscipula*	O
Guango	*Samanea saman*	R
Bitter Damson	*Simarouba glauca*	R
Prickley Yellow	*Nectandra sp.*	R
Red Birch	*Bursera simaruba*	R
Logwood	*Haematoxylum campechianum*	R
Senna Tree or Yellow Candle Wood	*Cassia emarginata*	R
Bullet Wood	*Dipholis sp.*	R

Transect 4

Overall Habitat Description: Degraded mixed forest. Many large tank bromeliads on forest floor. Charcoal burning observed in the general area. The forest floor is rocky.

Numbers of trees along transect: 12

Average canopy height: 9 m.

Common Name	Scientific Name	DAFOR
Guango	*Terminalis catappa*	O
Bastard Cedar	*Guettarda elliptica*	O
African Tulip Tree	*Spathodea campanulata*	R
Dogwood	*Piscidia piscipula*	R
Trumpet Tree	*Cecropia peltata*	O
Logwood	*Haematoxylum campechianum*	R
Calabash	*Crescentia cujete*	R
Indigo Berry	*Randia acuteata*	R
Bitter Damson	*Simarouba glauca*	R
Bull Hoof or Moco John	*Bauhinia divaricata*	R
Trumpet Tree	*Cecropia peltata*	R

Transect 5

Overall Habitat Description: Degraded dry forest mixed with logwood scrub.

Numbers of trees along transect: 14

Average canopy height: 8m.

Common Name	**Scientific Name**	DAFOR
Logwood	*Haematoxylum campechianum*	D
Dogwood	*Piscidia piscipula*	O
Lead Tree	*Leucaena leucocephala*	R
Lignum Vitae	*Guaiacum officinale*	R
Mountain Guava	*Piscidium montanum*	R
Dogwood	*Piscidia piscipula*	R
Lead Tree	*Luceanea sp.*	R
Crab Wood	*Alteramus lucidus*	R
Velvet Seed	*Guettarda elliptica*	R
Broom Thatch	*Thrinax parviflora*	R

LIST OF HERBS AND SHRUBS IDENTIFIED IN THE STUDY AREA

Common Name	Scientific Name
Wait-a-bit	*Pisonia acuteata*
Vervine	*Stachytarpheta jamaicensis*
Strong Back	*Cuphea parsonsia*
Broom-weed	*Sida acuta*
Oil Nut/Caster Oil	*Ricinus communis*
Wild Rosemarie	*Croton linearis*
Ram-Goat Dashalong	*Turnera ulmifolia*
Deadly Nightshade	*Urechites lutea*
Jamaica Dandelion	*Cassia occidentalis*
Orange Sage	*Lantana camera*
Duppy Gun	*Randia tuberosa*

VII PROPOSED SUBDIVISION LAYOUT – PART OF WHITEHALL, NEGRIL, WESTMORELAND

VIII MAP SHOWING SOCIAL INFRASTRUCTURE AROUND NEGRIL

MAP SHOWING THE PROPOSED SITE LOCATION AND SOCIAL INFRASTRUCTURE AROUND NEGRIL

LEGEND

- Health Centre
- School
- Police Station
- Road
- River
- Site Location
- Post Office
- Fire Station
- Church
- Cultural/Historic Site
- Residential and Other Buildings

1 0 1 2 Kilometers