

NORTHEAST MARINE MANAGEMENT AREA (NEMMA)

2007-2010 MANAGEMENT PLAN

**Updated to include OPAAL Baseline Studies and related documentation
(EDITED)**



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Notwithstanding the various contributions, I take full responsibility for the contents of this document.

Ivor Jackson

IJA

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EXECUTIVE SUMMARY

The Management Plan for the North East Marine Management Area (NEMMA) was commissioned for Antigua as part of the OECS Protected Areas and Associated Sustainable Livelihoods (OPAAL) Project. OPAAL is being executed under a partnership arrangement involving the OECS, the World Bank, Organization of American States (OAS) and Fonds Francais pour L' Environnement Mondial (FFEM).

Resource surveys and research projects have been carried out in the past 20 years for sections of the area that comprise the NEMMA. Documented threats to the endemic Antiguan Racer Snake, nesting birds, coral reefs and declining fish populations are some of the critical factors providing the justification for improved management of the area. Such threats are summarized in Part One of the Management Plan.

Management issues have been addressed prior to and during the Management Plan assignment by consultations involving Government agencies, resource users, private enterprise interest and other stakeholders. Stakeholder agreement on a management vision and objectives for the NEMMA is one of the benefits derived from these consultations. Another was the review of the Draft Management Plan.

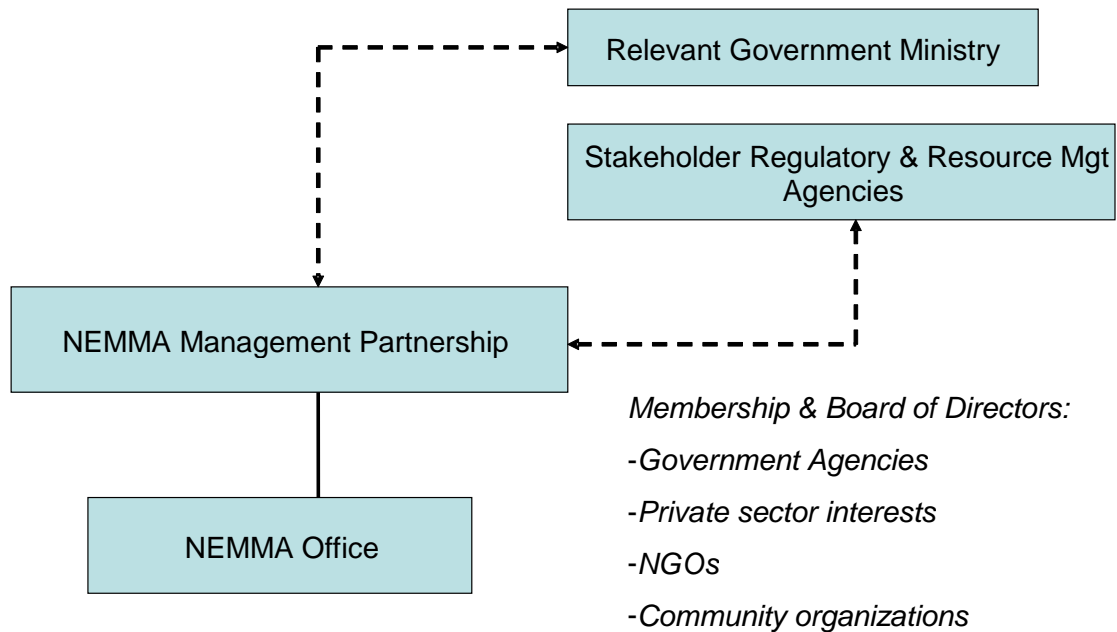
Both the management vision and objectives are critical to the management actions to be taken over the four year period of the Management Plan (2007 – 2010). The vision for the NEMMA (stated in Part Two of the Management Plan) is ***“a self-financing, multiple use (yachting, fishing, tourism, conservation, recreation) protected area that maintains and enhances the natural beauty and unique biodiversity of the area, both terrestrial and marine, supported by an efficient legislative framework and ongoing awareness program”***

Management objectives reflect the multiple uses of the area and its environmental and socio-economic importance. They seek to maintain biodiversity, promote scientific and socio-economic research, and monitoring, preservation of coastal water quality, scenic and natural beauty, promote and manage tourism and recreational uses, public education, awareness and appreciation of the area's heritage, sustain traditional uses and livelihoods and generally promote economic and social benefits at the community and national levels.

Three programme areas provide the framework for actions designed to help realize the vision and objectives over the four (4) year period. These are Conservation, Education and Sustainable use and Administration and Finance. Sub-programmes and associated activities are identified for each programme area. A timeline for completing various activities is indicated.

Management of the NEMMA is delegated to a not-for-profit company, called the NEMMA Management Partnership. The NEMMA Partnership will comprise stakeholders from government agencies and statutory bodies, hotel association, tour operations, the Environmental Awareness Group (EAG), Antigua/Barbuda Fisheries Alliance, community groups and other appropriate interests. The structure for management is as shown in the diagram.

Simplified Structure NEMMA Management



An important part of the structure is the NEMMA Office, whose staff is to be supervised by a Manager. The Office is to be housed temporarily in the Fisheries Complex at Parham Harbour. A Permanent facility to house the Office and a Visitor Center is to be located at the same site.

The Management Plan suggests the use of the OECS Monitoring and Evaluation (M&E) Scorecard for evaluation of management effectiveness and addresses research, zoning, regulatory and enforcement requirements. Zoning designations and zoning objectives have been identified for all of the NEMMA but the resources available for the preparation of Management Plan only allowed for zoning of two sections, referred to as core areas. These are Great Bird Island and its surrounding areas and Green Island and its surrounding areas. A review of the zoning designations, completion of zoning for the entire NEMMA and preparation of an overall zoning map using a GIS application should be done as a follow-up exercise.

In addition, experienced technical assistance is required to identify and address legal deficiencies in the NEMMA enabling legislation to give legal effect to management objectives and provide additional scope for regulations governing tourism and other activities not fully covered in the Fisheries Act under which the NEMMA was created.

PART 1: BACKGROUND

1.0 Introduction

1.1 Geographic Setting

The North-East marine management area (NEMMA) flanks the North-East coast of Antigua from Beggar's Point in the North to Friar's Head in the South encompassing the marine area landward to the edges of mangroves and wetland systems or the line of permanent vegetation and including numerous offshore islands (See Appendix 1 for the indicative boundary, coordinates and list of offshore islands). There are 28 named islands, plus other unnamed rocks and islands in the NEMMA.

1.2 Historic and Legal Context

The extensive coastal area within the NEMMA has a long history of multiple uses; relatively calm waters and various offshore islands have long attracted recreational boaters, for both day trips and overnight excursions. Residents from bordering communities such as Seatons and Parham regularly ply the protected waters and shallow reefs in small-scale fishing efforts, joined in recent time by modernised sport fishing and fly fishing enthusiasts. A soothing seascape interrupted by rugged coralline islands and very little else has attracted surging numbers of tourists each year, arriving on a number of day charter tour boats. Anchorages in the vicinity of Non Such Bay and Great Bird Island have also become attractive among the yachting community.

In addition to the local communities bordering the NEMMA, small residential areas also exist on some offshore islands. Long Island is home to the Jumby Bay hotel and residences, while Maiden Island and Pelican Island are privately owned and currently under development. Guiana Island, the largest land mass within the NEMMA has been the site of several development proposals, often met with public controversy owing to the extensive local use of the area and the grand scale of the proposed developments.

The NEMMA is also recognized as a globally significant research and conservation site as a refuge for endemic, rare and globally important wildlife including the critically endangered Antiguan racer snake (*Alsophis antiguae*), the hawksbill turtle (*Eretmochelys imbricata*), and the vulnerable West Indian whistling duck (*Dendrocygna arborea*). Consistent research, habitat restoration, and awareness-raising have been the cornerstones of over a decade of internationally supported conservation efforts on this site.

Encompassing over 30 square miles rich in coastal and marine resources, the North East coast has been brought into sharp focus for management agencies. From an ecological perspective, the offshore islands offer a living laboratory, serving as indicators to allow for the measurement of changes that have affected local conditions and the rest of the Caribbean over time. Economically speaking, and provided that sustainable use is practiced, the area's resources can provide a viable source of income for local fishery and tourism sectors, as well as a playground for local recreationalists. In August 2005, the NEMMA was declared a Marine Reserve under the 1983 Antigua and Barbuda Fisheries Act, Cap 173, in accordance with

section 22 (1). This legislation was welcomed by many groups, in fact many users referred to the area as a “park” or “reserve” for years before the designation became official.

1.3 Purpose, Scope, and Duration of the Management Plan

The purpose of the Management Plan is to provide guidance for the management of the NEMMA over the next 4 years, 2007 to 2010. One of its primary aims is to ensure that management programs and activities are committed to achieving the management vision and objectives for the NEMMA that have been agreed to by stakeholders.

The Plan is presented in two parts. Part 1 (Background) covers the area’s environment and resources, existing uses, current legal, institutional and management framework, along with impacts and threats. Part 2 (Management Plan) outlines the prescriptions for management. First, the management mission and objectives of the NEMMA are outlined. This is followed by a description of management programs and activities, the framework and organizational structure proposed for management, required monitoring and evaluation, an initial plan for zoning, a discussion of management regulation, enforcement and administration. The document also discusses public and stakeholder involvement in management.

1.4 Guiding Principles

Principles that guided the Plan’s preparation have been used to guide the management of similar areas with success in other countries:

- Stakeholder involvement is considered essential in building support for management objectives and rules designed to achieve them
- In small countries, with limited budgetary resources, government agencies and private enterprise must often work in partnership to achieve effective results; thus management must deploy creative mechanisms for interagency and public/private sector cooperation
- Since new areas are being charted in the management of the area, flexibility must be applied in implementing management rules and procedures, allowing for adjustments particularly in the formative years of NEMMA’s management; during these years, NEMMA’s leadership and staff are expected to perform but must also use them as a period of learning while seeking to build the awareness and support of stakeholders and users of the area’s resources

2.0 ENVIRONMENT AND RESOURCES

2.1 Seascape and Scenery

One of the most striking features of the North East coast is that it is physically beautiful. Luminous stretches of water and dramatic limestone rock formations create a feeling of seclusion amidst idyllic natural surroundings. With few exceptions, the islands and islets in this area are uninhabited and many are rarely visited by humans. They have therefore escaped much of development-related habitat destruction and other impacts that have affected mainland Antigua. Dense patches of mangroves, shimmering reef flats, rocky limestone cliffs, and shallow fringing reefs occupy much of the seascape. It is not unusual to spot Stingrays or Hawksbill turtles cruising in the shallow waters. Dense dry forests have colonized some of the larger islands, exposing tall cactus, agave, and other hardy deciduous plants to the elements.

What has evolved in the NEMMA is representative of the island's natural heritage – coastal ecosystems and landscapes that have been modified beyond recognition throughout most of Antigua and the rest of the Caribbean. The attraction this holds for tourist and resident visitors is testament to the unique cultural and spiritual significance of the area.

2.2 Mangroves

Bacon (1991) maps eighteen individual mangrove sites that fall within the NEMMA:

1. Elys Bay
2. Winthorpes Foot Creek
3. Nibbs Wharf
4. Parham Harbour
5. Crabbs Mill
6. Fitches Creek
7. Gaynors
8. Mercers Creek
9. Keeve's Landing
10. Spencers
11. Lords Cove
12. Fanny Cove
13. Ledeatt Cove
14. Ayres Creek
15. Guiana Island
16. Crump Island
17. Laviscount Island
18. Pelican Island

A 1997 assessment of mangroves in Antigua further shows that those sites within the NEMMA were considered to be of considerably better health and less degraded than other systems on the island. Those sites in bold type were also noted to have significant wildlife and fisheries value in addition to being considerably impacted by human activities (Bacon, 1991 & Nichols, 1997). Considering the residential and industrial uses of the North East coast, the mangroves in that area also play an important role in filtration and shoreline protection.

2.3 Coral Reefs and Seagrass Beds

The majority of reports suggest that the marine environment of the North East coast is in a significantly depleted state. Seagrass beds, dead fringing reefs, and occasional coral heads seem to characterize the majority of the marine area (IRF, 1996). A 2004 assessment of coral reefs in the North Sound showed less than 20% coral cover in the area and over 50% non-living substrate (ECSP, 2004). A 1996 study reported less than 5% live reef surrounding Great Bird Island (IRF, 1996). In both cases, deeper reefs showed improved health, however the majority of substrate displays macro algae overgrowth.

IRF found that within the North Sound, reefs in the vicinity of Prickly Pear Island appeared to be in better shape than most and offered the most attractive snorkeling sites. Compared to a 1988 study by Weiss and Multer, over half of the marine habitat boundaries remained in tact, though species composition was significantly altered. The coastline from Beggars Point to Parham harbour showed a consistent downward trend, with most previous reefs deteriorated to seagrass beds. Bunce (1996) finds that reefs showed pre-hurricane Luis damage strongly suggesting that reef degradation is the result of anthropogenic impacts.

The Leeward coast of Maiden Island has recently become the site of an artificial fringing reef constructed using Reef Ball technology. This is reported as the largest Reef Ball project to date, creating over 5000 coral colonies attached to over 1000 specially constructed reef modules (SDC, 2005). There is little information on the monitoring and success of this project, visual observation suggests that the reef has not yet established itself. The declining state of natural reefs coupled with the economic importance of fishing and snorkeling in the area suggests that ongoing marine monitoring and strong conservation measures should be instituted.

2.4 Marine Species

Studies show that fish communities within the North Sound display low species diversity and abundance. In fact, in 2004 Great Bird Island (GBI) had the lowest density of commercially important fish species (e.g. Snapper, Grouper, Parrot fish) compared to other local marine sites. However, the numbers of juvenile fish sighted does suggest an important nursery function of the GBI marine area (ECSSP, 2004). Within the larger area, commercially important Parrot fish and Surgeon fish are the most abundant species. Commercially important Caribbean Spine Lobster and West Indian Queen Conch are also harvested within the waters of the North East coast. Both are of conservation concern and subject to regulation by the Fisheries Division.

2.5 Wildlife

2.5.1 Birds

The Environmental Awareness Group (EAG) conducts ongoing research of seabird nesting populations on the offshore islands, primarily on the North East coast of Antigua. The offshore islands of Antigua provide refuges and nesting sites for several endangered, vulnerable and threatened species of seabirds.

Bird populations are reported to have soared following the eradication of rats from eleven offshore cays in 1995, and the EAG continues regular restoration activities to maintain the islands' rat-free status. Species of particular conservation concern include the endangered Brown Pelican, Red Billed Tropicbird, the Brown Noddy, West Indian Whistling Duck, and several species of terns. Active seabird research is currently conducted on Rabbit, Redhead, Lobster, Great Bird Island, and Green and York Island in the east. The majority of nesting islets are characterized by limestone cliffs covered by dry scrub vegetation and surrounded by mangrove and coral reef systems providing food and refuge to the seabirds. Whistling ducks, the most rarely sighted species, are known for inhabiting swamps, mudflats, and sheltered shorelines, and are easily scared from nesting and feeding sites. Isolation from human activity and predators on the mainland provides natural protection for seabird colonies in the North Sound. However, negative impacts of human activity are of concern including egg collection, and increased boat and human traffic in the area which may often disturb nesting birds and chicks.

2.5.2 Reptiles

Sea turtles are known to nest and feed within the NEMMA, and sightings have been recorded on several offshore islands. Specifically, sea turtle nesting research on the hawksbill turtle (*Eretmochelys imbricata*) has been conducted on Long Island for 20 consecutive years. Hawksbills are known to nest primarily from June to November, returning to a "home" nesting beach, corresponding to the area in which they were born. Since the inception of the Jumby Bay Hawksbill Project, 237 Hawksbills have been tagged on Long Island, indicating the significance of the area as a nesting ground. Annual research provides data on population estimates, trends, and reproductive patterns of the nesting population. Researchers also utilize the opportunity for public education, hosting visitors and school groups on turtle watching trips throughout the nesting season (JBHP, 2004).

The offshore islands of the North Sound are known to support at least five species of endemic lizards, as well as the endemic and critically endangered Antiguan racer snake (*Alsophis Antiguae*). The EAG conducts ongoing research on the Antiguan racer snake, as well as the ground lizard and anoles, both important prey species of the racer snake. Studies suggest that the endemic ground lizard (*Ameiva griseivolti*) is also of conservation concern. The viability of the racer snake population and other wildlife rests heavily upon the control of invasive species, particularly black rats. Since 1995 rat eradications, the racer population has grown from about 60 individuals to 240 individuals. An ongoing reintroduction program assists in establishing new habitats and maximizing genetic diversity. Offshore islands now offer the only viable

habitat for the species as predators (including rats, mongoose, cats, and dogs) are too numerous on the mainland. Snakes continue to face threats from potential invasive species and growing visitor activity.

2.6 Terrestrial Ecosystems

Though terrestrial areas occupy a relatively small proportion of the site, several studies point to the ecological significance of these zones. The typical dry forest – found on most of the larger of the North East coast islands – is classified by Lindsay and Horwith (1997) as ‘sub-tropical mixed evergreen-deciduous closed tree canopy alliance’ and listed as nationally uncommon and vulnerable. Individual native species, such as the *lignum vitae* are also listed as vulnerable. The flora of the offshore islands is not presently mapped or subject to regular monitoring. Around the islands, there are several popular beaches which are utilized by tourists and locals, notably on Prickly Pear, Guiana Island, Long Island, Maiden Island, Great Bird Island, and Green Island.

2.7 Archeological and historical resources

There are numerous archaeological and historical sites within the NEMMA.

2.8 Oceanography and water quality

Antigua and Barbuda are emergent parts of a 3,400 sq. km sub-marine platform, one of the largest in the Eastern Caribbean, as described by Ecoengineering (2007). The coastline of Antigua is markedly indented with numerous islands, creeks and inlets and associated sand bars and wetlands at their inland end. A large portion of the east, north and south coasts are protected by fringing reefs.

Antigua is affected by two ocean currents: the Antilles Current which flows north of Antigua and the stronger Caribbean current which flows to the south. Both flow towards the east or north east transporting warmer waters to the region. These currents dominate offshore but have less effect in nearshore areas (Coastal Systems International (undated) in Ecoengineering, 2007).

The available literature (see Ecoengineering, 2007) indicates that water quality in the NEMMA is poor. Discharges are reported from sewage treatment and desalination plants operated by surrounding hotels and from industries as the major contributors. Espeut (2006) summarises the findings of a 1996 Island Resources Foundation survey of the NEMMA which identified nutrient pollution causing algal growth, sedimentation from soil erosion, and heat and oil pollution from industry. IRF (1997, in Ecoengineering, 2007) identifies sedimentation from land erosion, dredging boat channels, building marinas and deposition of cleared material; eutrophication from inland farming; port and industrial pollution and solid waste disposal as potential water pollution problems in the NEMMA.

3.0 RESOURCE USES

3.1 Fishing

Fishing is a traditional activity within the NEMMA, carried out largely on an informal basis. The majority of fishers are considered part-time or seasonal fishermen. Landing sites coincide with the major communities: Beachcomber, Hodges Bay, Shell Beach, Fitches Creek, Parham, Seatons, Willikies, and Mill Reef. The primary fishing vessels operating in the area are open wooden boats, and occasionally modern fibreglass launches. However, many of the large scale commercial boats operating from landing sites within the NEMMA such as Parham would usually operate beyond the NEMMA boundaries. Fishers originating from landing sites outside the NEMMA also utilize the area, but the extent of this activity is undocumented. The level of total fish catch originating from the NEMMA therefore cannot be determined. The majority of fishers based within the NEMMA sell their catch in the villages as it is not large enough to warrant transport to the market in St. John's.

In order of importance, fishing methods include:

- Fish traps
- Gill nets
- Hand lines
- Trolling

- Diving

It is also estimated that half of all fishers engage in spear fishing, although it is illegal. Target species, in order of economic significance include:

- Snapper
- Grunt
- Surgeon fish
- Parrot fish
- Lobster
- Conch

While the region around Great Bird Island has shown the lowest density of economically important fish species, high levels of juvenile species have been recorded suggesting a nursery function of the area, which is corroborated by local fishers.

Overall fishery activity and productivity has been increasing on a national level, contributing to 50% of agricultural GDP in 2002 (Horsford, 2004). The NEMMA encompasses 7 out of a total of 18 landing sites on Antigua. Fisheries Division Vessel Frame Survey 2001 indicates that Communities within the NEMMA saw a 10% increase in the numbers of registered fishers between 1992 and 2001 (from 120 to 132). The numbers of registered fishing boats, however, decreased by 26% over the same period (from 72 to 53). Fishing is cited as an important safety net economic activity that subsidizes other economic shifts, which are severe in Antigua's seasonal tourism market. All the fishermen interviewed during the stakeholder surveys by Ecoengineering (2007) felt that making the reef a marine protected area would have a positive impact on the reef if properly managed. The same fishers supported the concept of zoned management for the park rather than total restriction of fishing, which would have a negative impact on their livelihood.

3.2 Diving and Snorkeling

The area within the NEMMA contains few established dive sites; however there is considerable snorkeling activity. Long Bay offers one of the most popular dive and snorkel sites within the area. Snorkeling also occurs in the coves around Non Such Bay, Green Island, Great Bird Island, Hell's Gate, Maiden Island, Long Island, and Prickly Pear. Hotels surrounding the NEMMA, as well as day tour operators typically offer snorkeling tours to tourists. Locals and yachters often bring their own gear to the site.

3.3 Beach Recreation and Swimming

Tourists and local visitors utilize offshore island beaches and swimming areas, specifically on and around Prickly Pear, Guiana Island, Long Island, Maiden Island, Great Bird Island, and Green Island. Over 200 tourists are expected to arrive on Great Bird Island each day via day tours. Studies estimate an average local crowd on weekends at Great Bird Island of about 70 persons, and a holiday crowd of up to 350 persons.

The majority of local visitors arrive by private powerboats, many camping overnight. Visitation to the islands is increasing steadily, perhaps more severely on Great Bird Island than on other islands. One factor affecting this trend is available beach space – limited on both Prickly Pear and Guiana Island. Another major factor is the privatization of Maiden Island, forcing visitors to move to Great Bird and other larger areas such as Green Island. The majority of local visitors represent a pattern of long term traditional use by several family groups. Visitors originate from neighbouring communities as well as other parts of Antigua.

It is predicted that GBI will continue to receive most of the impacts of growing crowds, while Green Island may face impacts from overflow visitors. Scientists have raised several concerns about carrying capacity levels on the islands and beaches, and potential impacts on wildlife habitats. Additionally, numerous stakeholders are concerned about littering on the islands, which is unsightly and creates potential for rat reinfestation. It has been widely suggested that other offshore beach options such as Guiana Island be encouraged.

3.4 Kayaking and Other Water Attractions

Several water sports operations are based within and around the NEMMA renting speedboats, sail boats, kayaks, wind-surfers, and kite surfers for use within the marine management area including Sunsail, Kite Antigua, and Paddles. Many hotels surrounding the NEMMA also have small water sports operations.

Kayaking tours, conducted by Paddles are conducted through the mangroves off Pelican Island and Guiana Island. Sting Ray City also operates tours of an open ocean sting ray enclosure North East of Guiana Island.

3.5 Boat Tours

Approximately 18 boating excursion companies are recorded to operate within the North Sound area. Tours typically cruise through the scenic waters of the North Sound, stopping on islands (primarily Great Bird Island, also Prickly Pear, Green Island, and Hell's Gate) for hiking, picnicking, and snorkeling on the near shore reefs. Nesting seabird colonies and the unique wildlife of Great Bird Island are promoted as highlights. A key feature of stop-off islands is the availability of attractive beaches. With two beaches, Great Bird is thought to offer the most optimum mix of features.

Boats range from large catamarans to medium sized speedboats and small skiffs. Larger boats anchor offshore, and many pull onto the beaches; there is no mooring system in place. Boating tourism is considered by far the most intensive use of the area immediately surrounding Great Bird Island. Feedback from tour operators suggests visitor levels of over 40,000 persons per year to the islands, the majority of boat visits corresponding to the peak tourist season, November through April. Visitation to Green Island is also a growing trend.

Boat trips have high commercial value and costs of tours range from US\$40.00 per person to US\$1200 for day charters. Most tour operators welcome management interventions and are also interested in improved facilities such as moorings, picnic areas, and safety measures on trails. Tour operators have also expressed willingness to charge user fees to guests.

3.6 Yachting

A number of anchorages in the vicinity of Non Such Bay, Green Island, and Great Bird Island attract private yachts to the area. Yachters typically make use of the snorkeling, beaches, and the amenities at Parham, Jumby Bay, and Harmony Hall.

3.7 Ferries

The Jumby Bay Resort on Long Island transports guests and staff via two ferries: one departing from the Beachcomber Dock and one from Parham Harbour. Ferries operate on a frequent basis throughout the day.

3.8 Shipping

Industrial uses at Crabbs Peninsular create a demand for cargo transport. A navigation channel and turning basin 16 ft to 20 ft deep allows ships to dock and unload their cargo in the area of the cement factory.

3.9 Recreational Infrastructure

Within the uninhabited islands and marine zones of the NEMMA there is little substantial recreational infrastructure. A small restaurant and bar operation is conducted on Prickly Pear Island. Great Bird, Guiana, and Green Island have make shift picnic tables and old barbeque

pits that are used by visitors. There is also the ruin of an old farmstead on Guiana Island, which has significant historical interest.

3.10 Coastal and Shoreline Uses

3.10.1 Marinas and Jetties

Parham Harbour is the only major harbour within the NEMMA, providing very sheltered anchorage and docking for ships at Crabbs and fishing boats at Parham's waterfront. Parham has port of entry status. There is a marina and boat yard at Shell Beach and private jetties at Jumby Bay (Long Island), Maiden Island, and Harmony Hall and Barnacle Point.

3.10.2 Communities

The following communities can be found surrounding the NEMMA:

- Hodges Bay / Benaire
- Fitches Creek
- Coolidge
- Airport
- Parham
- Vernons
- Glanvilles
- Seatons
- Willikies
- Long Bay
- Long Lane
- Browns Bay / Mont Pellier / Gaynors
- Mill Reef / Half Moon Bay
- Royals
- Cedar Grove
- New Winthorpes
- Piggots
- Crabbs
- Pares
- Jumby Bay (Long Island)

In one NEMMA community surveyed by EAG (2006), residents identified involvement in livelihoods including fishing, tourism, domestic work, vending, and business ownership / management. Interestingly, persons from almost all professions stated that their livelihoods depended on their use of the proposed North Sound management area and environs, suggesting a strong link between NEMMA and surrounding communities.

3.10.3 Industries

Several industrial operations border the NEMMA including:

- V.C. Bird International Airport
- Crabbs Electric Power Plant
- Crabbs Desalination Plant
- Crabbs Brewery
- Crabbs Slipway and Marina
- Crabbs U.S. Navy Communications Facility
- Piggot Quarry

An IRF (1996) report provides an overview of possible impacts of these operations on the coastal area, including sediment runoff, sewerage discharge, oil discharge, thermal discharge, industrial utility waste, and ship anchorage impacts. It appears that most of the major industrial activity is based on the Crabbs Peninsula. Information on the impacts of industrial activity needs to be updated and mitigation measures specifically addressed.

3.10.4 Hotels and apartments

Several hotels and apartment complexes are also located within the NEMMA as listed in Table 3.1 below.

Table 3.1: Major hotels and apartment blocks within the NEMMA.

Hotel	Number of rooms	Location
Antigua Beachcomber	28	Coolidge
Jumby Bay Hotel	40 +11 villas	Long Island
Occidental Grand Pineapple Beach Resort	150	Long Bay
Long Bay Hotel	40 + 5 cottages	
Dian Bay Resort and Spa	49	
Emerald Cove	129 apartments	Non Such Bay
Harmony Hall	6 rooms in 2 villas	Harmony Hall

Source: The Antigua and Barbuda Hotels and Tourism Association (in Ecoengineering, 2007)

With the exception of Occidental Pineapple, these hotels are small to medium sized establishments. Surveys suggest that many residents of the area are employed in connection to the hotel / restaurant industry. No hard data on the impact of these hotels and restaurants (via physical development, run off, waste management, etc.) is available, but should be studied to determine the overall carrying capacity of the area and guidelines for further development.

3.10.5 Agriculture

Agriculture is common in the watersheds which drain into the NEMMA, including around Parham, Betty's Hope, Willikies, Freetown, Bethesda, Newfield and St. Phillip in the Potswork area. There are an estimated 80 – 100 farmers growing mainly vegetables, root crops and small amounts of cotton. Farmers are encouraged to use good agricultural practices to control soil erosion and pests. Agrochemicals imported into Antigua and Barbuda and likely to be used in these areas are listed in Table 15 of Ecoengineering (2007). The impacts of these products on the NEMMA is not known.

3.10.6 Vending

Vendors operate on beaches in the NEMMA selling T-shirts, wrap skirts, other hand-made clothing, handicraft jewelry and other ornaments, and souvenirs to tourists. Most vendors use make shift tents with strings tied along the sides of the tents and table tops to display their exhibits, there is some competition for the best pitches.

3.10.7 Land ownership and development planning

Lands adjacent to the NEMMA are either privately owned or are crown lands. The majority of the offshore islands are privately owned (see Table 1 in Ecoengineering, 2007).

Government proposals for land use in different areas is given in the National Physical Development Plan (see Figure 13 in Ecoengineering, 2007). Lands adjacent to the NEMMA are mostly identified for industrial uses, tourism and residential development (see Ecoengineering, 2007, for details).

3.11 Research, Awareness and Education

As a long proposed management area, there has been considerable scientific research undertaken within the NEMMA, particularly the area surrounding Great Bird Island which is considered the most sensitive biodiversity area within the site. The area encompasses a wide range of ecosystems and serves as critical biodiversity habitat. Various marine studies have taken place within the NEMMA, facilitated by the Fisheries Division and focusing mainly on coral reefs, seagrass habitat, and fishery assessments.

The Antiguan Racer Conservation Project (ARCP) is a major research and conservation initiative in the North Sound area. The goal of the ARCP is to conserve indigenous and globally significant populations of flora and fauna of the offshore islands of Antigua, and to promote the sustainable use of resources found there. This project has been active since 1995 and has been used as a model for conservation in other small islands, particularly for their work on critically endangered populations and invasive species control. The ARCP also coordinates an annual summer training program that attracts students and researchers from the region and abroad.

The Jumby Bay Hawksbill project has conducted 20 years of Hawksbill (*Eretmochelys imbricata*) sea turtle nesting research on Jumby Bay. Saturation tagging, based on hourly patrols maintained throughout the prime nesting season and the tagging of all nesting Hawksbills are the cornerstones of the project's research on the reproductive biology and population ecology of this critically endangered species. The Jumby Bay Hawksbill Project (JBHP) is an initiative of the Wider Caribbean Sea Turtle Conservation Network (WIDECAST), a region-wide scientific network and Partner Organization to the United Nations Caribbean Environment Programme. The JBHP has been privately funded since its inception by the homeowners on the island and coordinated by the University of Georgia. The project has also served as training grounds for researchers from other islands and around the world.

Both major conservation projects operating within the NEMMA also offer unique educational opportunities to local youth and the general public. The ARCP coordinates a multi faceted education and awareness program based on the offshore islands including curriculum development, public awareness campaigns, teacher training, and field trips. Popular "Floating Classroom" field trips expose hundreds of students to ecology and conservation efforts on the offshore islands each year. Similarly, the JBHP conducts school visits and hosts sea turtle nesting tours during the field. Both projects comment that the demand for educational activities within the area is far greater than either group can support.

4.0 EXISTING LEGAL, INSTITUTIONAL AND MANAGEMENT FRAMEWORK

4.1 Relevant Laws and Regulations

The NEMMA is designated by the Minister of Agriculture, Lands, Marine Resources, and Agro-industries under Section 22 of the Fisheries Act, 1983, Cap. 173. Section 22(1) of this Act provides for the Minister to declare any marine area of Antigua and Barbuda and adjacent lands to be a marine reserve where special measures are considered necessary to:

- (a) "to afford protection to the flora and fauna of such areas and to protect and preserve the natural breeding grounds and habitats of aquatic life , with particular regard to flora and fauna in danger of extinction;
- (b) to allow for the natural regeneration of aquatic life in areas where such life has been depleted;
- (c) to promote scientific study and research in respect of such areas; or
- (d) to preserve and enhance the natural beauty of such areas"

This legislation evidently allows for the management and conservation of an array of marine resources, as well as natural seascape features. Additionally, it allows for the development of regulations for management and protection of marine reserves, including the establishment of closed seasons, restricted areas, and controlled take of turtles, coral, lobster, conch; control of dredging, construction, and other marine related activities.

While the Fisheries Act does make some provisions for physical development of terrestrial areas within the reserve, protection of flora and fauna is confined to marine organisms. The Forestry Act (1941) designates the Forestry Unit as responsible for management and development of forest and forest resources, including wildlife.

Some protection is afforded to several listed avian species; however these lists need to be revised to reflect current conservation concerns. Serious legislative gaps do exist for the protection of most terrestrial species, as well as mangrove forests. Furthermore, the legislation does not provide for the development and implementation of site management plans, although the development of such a plan is generally accepted practice.

4.2 Agencies, NGOs, and Community Organizations

Despite the lack of formal designation or a defined management strategy, there has been a substantial level of resource management initiatives within the NEMMA over the last decade. In 1996, the concept of the Northeast Coast Management Area (NECMA) and Bird Island Marine Reserve and Wildlife Sanctuary was advanced by the Parham Harbour Facilitation Project, supported by the Organization of American States.

Later, in 2003, a similar area of the North East coast was proposed to become a National Park site, an initiative which was not completed. Alongside these designation efforts, ongoing management activities have been conducted in the area, by the Antigua Fisheries Division in the case of fisheries and marine resources, and by the Antiguan Racer Conservation Project (ARCP) in the case of terrestrial conservation and management.

The Ministry of Lands, Agriculture, Marine Resources and Agro-industries via the Forestry Unit has facilitated the work of the ARCP to conserve and restore the Antiguan racer and other threatened native species and habitats. This initiative, implemented by the Environmental Awareness Group, is a partnership of several regional and international organizations including Fauna & Flora International, the Durrell Wildlife Conservation Trust, the Island Resources Foundation, and the Ministry of Lands, Agriculture, Marine Resources and Agro-industries.

Since the eradication of invasive Black Rats from several offshore islands in 1996, the project has conducted a comprehensive programme of ecological restoration, endangered species monitoring and reintroduction, education and awareness, and stakeholder outreach promoting improved stewardship of core areas within the site. The work of the ARCP has laid the early foundation for management of the NEMMA, and it is acknowledged that this partnership continues to play a leading role in assisting with resource management.

In practice, a wide cross-section of government and community agencies has been involved in management efforts, as shown in the Table 4.1. Many additional organizations were identified during the course of developing this plan that should also be included in future management efforts.

4.3 Stakeholder Cooperation

Stakeholders within the NEMMA can be grouped into seven broad categories as follows:

- 1) Management Agencies
- 2) Communities
- 3) Fishers
- 4) Tour Operators
- 5) Recreational users
- 6) Private developers
- 7) The general public

Table 4.1: Government Agencies and Community Organizations Involved in Management Efforts

Sector	Government Agencies	NGO / Community Organizations
Conservation & Research	<ul style="list-style-type: none"> – Fisheries Division – Forestry Unit – Environment Division – National Parks Authority – Ministry of Education 	<ul style="list-style-type: none"> – Environmental Awareness Group (EAG) – Community residents and local volunteers (unorganized) – Antigua and Barbuda State College
Tourism & Recreation	<ul style="list-style-type: none"> – Ministry of Tourism – Antigua and Barbuda Coast Guard – Antigua and Barbuda Marine Services – Development Control Authority 	<ul style="list-style-type: none"> – Tour Operators / Antigua and Barbuda Excursions Alliance – Powerboats Association – Offshore island recreational users (unorganized) – Hotels surrounding NEMMA (Pineapple Allegro, Jumby Bay, Sunsail, etc.) – EAG
Fishing	<ul style="list-style-type: none"> – Fisheries Division – Antigua and Barbuda Coast Guard 	<ul style="list-style-type: none"> – Fishers / Fisherman's Alliance
General Development	<ul style="list-style-type: none"> – Economic Planning and Policy Unit – Development Control Authority 	<ul style="list-style-type: none"> – Large private land owners (Mill Reef Club, Jumby Bay, etc.)

Historically, there has not been severe conflict between users, however, with the expansion of tourism, recreation, and fishing activity, resource conflicts have certainly increased in recent times. For years users have strongly supported the establishment of management guidelines for the area, reflecting a willingness to cooperate with each other for the benefit of all. Some stakeholder groups have organized among themselves, promoting various forms of self-regulation and management, particularly in the tourism sector. Users have also worked together in voluntary conservation efforts, training workshops, and management consultations.

Management agencies demonstrate good working relationships with area users, especially evident in the willingness of users to contribute to the management planning process. It has

long been noted however that there is a need for greater coordination, information sharing, and general cooperation amongst management agencies. The scope of resources within the NEMMA requires input from a number of agencies for effective management, but there is currently no effective coordinating mechanism. Aside from this, the most potent conflicts have centred on large scale development proposals for the area, highlighting the need for greater consultation and cooperation between major stakeholders, private developers, and the Development Control Authority.

4.4 Staffing and Capacity

There is presently no staff dedicated to management of the NEMMA or central management office. In the past, personnel from key management agencies (Fisheries Division, Forestry Unit, Environment Division, Ministry of Tourism, National Parks Authority) and the EAG have worked collaboratively on management issues. As such, some technical capacity does exist for management activities, particularly in the areas of biological research and environmental education.

With little history of protected areas management in Antigua and Barbuda, there is great need for capacity building in this area among all resource management agencies. The National Parks Authority offers the most experience in management of protected sites, however the features of the NEMMA present a very different management scenario than the long established Nelson's Dockyard National Park, and different approaches will be required.

International partners of the Antiguan Racer Conservation Project have also served as a resource for building local capacity for resource management in the NEMMA. Human resource limitations have perhaps presented the greatest challenges for management capacity, as management agencies have limited personnel to dedicate to NEMMA activities and engage in effective capacity building programs. This indicates that the NEMMA budget should provide dedicated staff for execution of activities, as well as provisions for personnel training.

4.5 Management Infrastructure and Equipment

There are no significant infrastructure and equipment currently deployed in the management of the NEMMA. Management presence is limited and the Fisheries Division depends on the support of the Coast Guard for observations and surveillance. Other management initiatives are usually associated with research projects at Great Bird Island, or otherwise linked to other research efforts of private interests.

4.6 Funding and Budget

Support for management activities within the NEMMA has been provided through contributions of the key management agencies and international donor funding. A considerable number of services have also been provided on a voluntary basis. Management interventions conducted through the Antiguan Racer Conservation Project have an estimated value alone of US\$150,000.00 per year. Without formal management, it is impossible to account for all investments to the area, but it can be estimated to be reasonably higher than this figure.

5.0 IMPACTS, THREATS, POTENTIAL MITIGATION

Table 5.1 lists some of the threats and impacts to the environment of the NEMMA. Mitigation actions that could be taken are also indicated. Measures include planning, institutional and organizational building for enhanced technical, administrative and enforcement capacity and improved legal and financial systems.

Table 5.1: Existing Threats, Impacts and Potential Mitigative Actions

Threats	Impacts	Potential Mitigation
I. Marine Environment Reef damage surveyed shows little hurricane damage, suggesting degradation from human activities. Threats include: <ul style="list-style-type: none"> • Snorkeling and walking on reefs • Anchoring of boats on reefs • Boat discharge • Pollution from coastal industry and development • Dredging for development • Fishing methods (fish traps, ghost traps and nets, spear fishing) • Overfishing • 	Marine depletion: <ul style="list-style-type: none"> • dwindling area of living reef • macro algal overgrowth • low fish abundance and diversity • destruction of seagrasses and reef flats 	<ul style="list-style-type: none"> • Snorkeling trails • Fixed moorings • Treatment and diversion of industrial discharge • Zoning of activities including no-take zones • User training and awareness • Warden patrols
II. Terrestrial Environment Overcrowding	<ul style="list-style-type: none"> • tranquillity of the site is being lost • heavy traffic disturbs already threatened wildlife populations. 	<ul style="list-style-type: none"> • Staggering of tour groups • Controls on visitor numbers or visitation times • Encourage alternative beach sites
Noise disturbance	<ul style="list-style-type: none"> • boat / human traffic in close proximity to sensitive sites scares nesting seabirds and can be life threatening to newborn chicks • 	<ul style="list-style-type: none"> • Zoning • User awareness
Vegetation Clearing (forest, grasses, mangroves)	<ul style="list-style-type: none"> • removal of vegetation that serves as important coastal stabilizers and wildlife habitats 	<ul style="list-style-type: none"> • Zoning • User awareness
Improper waste disposal on offshore islands	<ul style="list-style-type: none"> • garbage and litter, as well as human waste pose a severe health hazard, opportunity for rat reinfestation, and unsightly surroundings 	There are two types of debated mitigations: <ol style="list-style-type: none"> 1) enforcing self-collection of garbage and waste (each person removing their own garbage and portable camping toilets)

		<p>2) providing waste collection and toilet facilities</p> <p>According to stakeholder reports, option 1 is usually preferred as it promotes responsibility among users, and avoids the construction and maintenance of facilities</p>
<p>Resource conflicts:</p> <p>3) fishermen and tour operators</p> <p>4) wildlife and visitors (including pets)</p> <p>5) users and developers</p>	<ul style="list-style-type: none"> • overuse of certain sites, user conflicts, and ecological damage 	<ul style="list-style-type: none"> • Zoning • Pet restrictions
Introduction of invasive species (via boats, luggage)	<ul style="list-style-type: none"> • Black rats threaten endangered species, especially the racer snake 	<ul style="list-style-type: none"> • Fixed moorings • User awareness • Invasive species prevention and monitoring
Development of offshore islands and surrounding coastline	<ul style="list-style-type: none"> • Ecological damage and access restrictions 	<ul style="list-style-type: none"> • Zoning • Cooperation with developers and the Development Control Authority
III. General issues		
No legislation prohibiting harming, taking, or killing wildlife or species recovery plans at the national level	<ul style="list-style-type: none"> • Wildlife decline or extinction due to human actions 	<ul style="list-style-type: none"> • Enact appropriate legislation • Develop species recovery action plans
<p>Resource conflicts:</p> <p>1) fishermen and tour operators</p> <p>2) wildlife and visitors (including pets)</p> <p>3) users and developers</p>	<ul style="list-style-type: none"> • overuse of certain sites, user conflicts, and ecological damage 	<ul style="list-style-type: none"> • Zoning • Pet restrictions
Lack of management capacity (financial, technical, institutional)	<ul style="list-style-type: none"> • Management issues inadequately addressed at the national level 	<ul style="list-style-type: none"> • Development of sustainable financing mechanisms • Technical capacity building / training with other sites in the region • Development of effective legal and institutional framework for protected areas
Absence of a site-level management structure for the NEMMA	<ul style="list-style-type: none"> • Management issues inadequately addressed at the local level 	<ul style="list-style-type: none"> • Development of NEMMA office and Management partnership (based on OPAAL Site Implementation Entity or 'SIE')
Absence of a coordinated national policy framework systems plan for protected areas	<ul style="list-style-type: none"> • Protected area programming driven by sector and sub-sector needs rather than a systematic planning process. 	<ul style="list-style-type: none"> • Development of national policy and systems plan for protected areas (note OPAAL support for these areas)
Hurricanes	<ul style="list-style-type: none"> • Destruction of marine and terrestrial habitats • Wildlife decline or extinction 	<ul style="list-style-type: none"> • Preparation of an emergency response plan

PART 2: MANAGEMENT PLAN



6.0 VISION AND OBJECTIVES OF THE NEMMA

6.1 Management Vision

The purpose of the management plan is to provide guidance for the management of the NEMMA over the next 4 years, 2007 to 2010.

The management vision for the NEMMA evolved during various stakeholder consultations. (See Appendix 4). It seeks to achieve

“A self-financing, multiple use (yachting, fishing, tourism, conservation, recreation) protected area that maintains and enhances the natural beauty and unique biodiversity of the area, both terrestrial and marine, supported by an efficient legislative framework and ongoing awareness program”

6.2 Objectives

The reasons for establishing marine reserves as outlined in Section 22 (1) of the Fisheries Act, 2006, are to:

- Protect flora and fauna of such areas and protect and preserve the natural breeding grounds and habitats of aquatic life
- Allow for natural regeneration of aquatic life
- Promote scientific study and research in the areas
- Preserve and enhance the natural beauty of such areas

In a consultative meeting with stakeholders of the area, the list of objectives was clarified and it was agreed that the NEMMA should be managed to:

- Protect the biodiversity of the area
- Provide opportunities for scientific and socio-economic research, and for monitoring the impact of uses and management actions
- Maintain the quality of coastal waters
- Preserve and enhance the natural scenery and beauty of the area that are inherent in the relationships between land and seascapes
- Promote and manage tourism and recreational uses
- Provide public education, awareness and appreciation of the area's heritage
- Sustain traditional uses and livelihoods
- Promote economic and social benefits at the community and national levels

Two other suggested objectives during the consultation were:

- Development of an effective legislative framework
- Establishment of a model for management of other protected areas

The first is however considered a means towards achieving the above stated objectives for the NEMMA and the second a tool to be applied in support of management of other areas.

7.0 MANAGEMENT PROGRAMS, SUB-PROGRAMS AND ACTIVITIES

During the Plan period, the Partnership, staff and friends of the NEMMA will work towards achieving its goal and objectives by implementing three (3) management programs:

- Conservation
- Education and sustainable use
- Administration and finance

Each programme area is broken down into a number of subprograms, for which specific objectives seeking to achieve the more general management objectives and the vision of the NEMMA are stated. Activities designed to achieve the objectives are identified for each programme or sub-programme with a suggested timeline. Shaded areas in the activity matrix suggest the year or years in which the activity is timed to occur and the dates indicate the anticipated deadline for completion of the tasks associated with the activity.

7.1 Programme 1: Conservation

7.1.1 Subprogramme 1A: Natural Resource Protection

7.1.1.1 Objectives

- Maintain biological diversity
- Conserve economically valuable resources
- Promote recovery of rare, threatened, endangered or overexploited species of the NEMMA

7.1.1.2 Activities

Activity (Subprogramme 1 A)		Timeline			
		2007	2008	2009	2010
a)	Complete the zoning of the entire NEMMA & prepare Zoning Map using GIS application; work towards building stakeholder support for prohibited activities defined by zones of the Zoning Plan		12/07		
b)	Commission legal review and evaluation of statutory deficiencies adverse to management of the NEMMA		06/08		
c)	Engage legal assistance to assemble and further draft a comprehensive package of management regulations governing various activities and uses in the NEMMA		12/08		
d)	Design, construct and deploy boundary buoys for zones to help manage uses as prescribed in the Zoning Plan			05/09	

e)	Design, construct and deploy fixed moorings for tour boats to implement no anchor regulations and reduce anchor damage		12/08		
f)	Design, construct and deploy fixed moorings for yachts to achieve the same aims as (e)		12/08		
g)	Seek funding to install buoys marking channels (i) north of Great Bird Island and (ii) north of Green Island to provide alternative and shorter routes for day and term charter yachts and for tour boats, and other reef markers as required		10/08		
h)	Commission & deploy facilities & equipment for surveillance & enforcement (including patrol boats, VHF radio)			1/09	
i)	Submit draft legislation providing appropriate authority to NEMMA Wardens		12/08		
j)	Install prohibitive signage to prevent visitors from trespassing in sensitive Antiguan Racer Snake habitat areas and critical bird nesting habitat [201.2.2.1]		12/08		
k)	Work with Fisheries Division and Antigua/Barbuda Fisheries Alliance in seeking government approval on limits in the export of parrot fish		04/08		
l)	Draft and submit for passage, management regulations to protect resources within agreed zones of the NEMMA		12/08		

7.1.2 Subprogramme 1B: Natural Resource Management

7.1.2.1 Objectives

- Provide required staff and infrastructure to manage resources and resource users
- Promote stakeholder participation in management

Activity (Subprogramme 1 B)		Timeline			
		2007	2008	2009	2010
a)	Equip temporary NEMMA Office at Fisheries Complex in Parham Harbour, provide storage and berthing facilities		12/08		
b)	Commission feasibility study & design concept for permanent NEMMA Office and Visitor Center		12/08		
c)	Build NEMMA Office/Visitor Center			12/09	
d)	Recruit NEMMA staff ; Manager, others (see employment time frame, Section 13.1)		12/08		
e)	Commission two (2) 27ft boats & two (2) 15 ft boats for the use of NEMMA staff, including patrol & surveillance			03/09	
f)	Fully equip boats with equipment: life vests, VHF hand-sets for staff, flares, first aid kits, etc. and recognizable signage			12/09	
g)	Purchase one (1) 4x4 pickup and one (1) 4x4 jeep for traveling and movement of equipment, boat trailers, etc. by NEMMA staff			01/09	
h)	Strengthen collaborative procedures with customs to monitor exports of parrot fish	11/07			
i)	Adopt and apply standards for trail improvements at Great Bird Island		12/08		
j)	Carve steps into limestone at steep area of trail leading to the ridge at Great Bird Island; install handrail in that area also		12/08		
k)	Introduce & maintain erosion control measures for trails at Great Bird Island		12/08		
l)	Establish MOUs selected with stakeholder organizations, associations or		12/08		

	individual service providers in partnership management in areas of monitoring, surveillance and environmental awareness				
m)	As an interim or medium term measure, negotiate agreements with private enterprise partners to operate NEMMA visitor information points or centers at their businesses; examples could be Stingray City, Shell Beach Marina		12/08		
n)	Establish and apply minimum requirements for the operation of information points or centers: example welcome signage, interpretative signage & other material, toilets, etc.		12/08		
o)	Adopt and apply minimum standards or best practices to be applied at visitor information & other visitor use areas of the NEMMA in such areas of safety & security, health and sanitation, including food handling, trail maintenance			02/09	
p)	Purchase portable toilets for use on Great Bird Island and other islands as appropriate		12/08		
q)	Prepare an emergency response plan including mitigation measures to be activated in case of natural and man-induced disasters		10/08		

7.1.3 Subprogramme 1C: Research and Monitoring of Environmental Quality and Resource Use

7.1.3.1 Objectives

- Build an adequate data base for management and protection
- Provide the Management Partnership with information to make sound management decisions
- Disseminate and use local knowledge in resources management

Activity (Subprogramme 1C)		Timeline			
		2007	2008	2009	2010
a)	Collaborate with selected partners in building a management data base for the NEMMA				12/10
b)	Devise a mechanism to collaborate with Environment Division, DCA & Fisheries Division in Monitoring marine impacts from development projects in the NEMMA		06/08		
c)	Devise and implement a plan to gather reliable data on levels of resource uses in the NEMMA: ships, yachts, tour boats, kayaking operations, fishing activities				12/10
d)	Design and execute quarterly visitor satisfaction surveys				
e)	Design and implement an ongoing programme to monitor with other partners land based discharges from wastewater treatment plants and RO plants				12/10
f)	Develop capacity within NEMMA office for GIS application in ArcView or GIS software to assist with mapping, and data analysis				
g)	Map and measure all mangrove and marine areas of the NEMMA as the basis for developing the zonation plan and monitoring changes		07/08		
h)	Monitor population changes to threatened, rare or endangered species				
i)	Design and implement a monitoring programme for selected reef areas with high levels of recreational snorkeling or diving; (invite the tour operators to collaborate)				12/10
j)	Agree on and implement observation and measurement methodology to				2/10

	determine carrying capacity limits for Great Bird Island and other heavily used sites in the NEMMA				
k)	Undertake research on past and present animal and plant species				6/10
l)	Complete survey and documentation of plant species on offshore islands of the NEMMA			12/09	
m)	Design & implement study to define and value important nursery areas of the NEMMA				6/10
n)	Seek funding for and continue/expand existing Racer Snake census, rat eradication and sea turtle monitoring programs				12/10
o)	Use results of baseline survey being done for the NEMMA by Eco-engineering to help monitor resource impacts			12/09	

7.2 Programme 2: Education and Sustainable Use

7.2.1 Subprogramme 2A: Environmental Education, Public Awareness and Communications

7.2.1.1 Objectives

- Build community support for NEMMA zoning and regulations
- Reduce use conflicts between resource users
- Establish the credibility of the Management Partnership among communities, resource users and other stakeholder interests
- Promote compliance with regulations and rules by commercial and recreational users
- Promote the recreational and eco-tourism attractions of the NEMMA

7.2.1.2 Activities

Activity (Subprogramme 2A)		Timeline			
		2007	2008	2009	2010
a)	Commission design of NEMMA logo to be used on letter heads, vehicles, boats, staff uniform, signage, souvenir items, etc. [203.1]		12/08		
b)	Adopt and apply standards for all forms of signage, to include size, font, colour, material and other relevant details [203.1]		12/08		
b)	Develop and implement an effective interpretation strategy to promote awareness, appreciation and sustained use of NEMMA's heritage resources		12/08		
c)	Negotiate with appropriate businesses to construct and install interpretative signs at all marinas and hotels fringing the NEMMA; such signs to provide information and user guidelines for the benefit of guest and staff		12/08		
d)	Design and execute a series of radio and TV public awareness programs for awareness building and education		12/08		
e)	Commission the design of a NEMMA website and provide capacity for its ongoing management		06/08		
f)	Have NEMMA brochures and Fact Sheets designed and published for specific target groups including tourists, other visitors to the NEMMA, school teachers and children		12/08		12/10

g)	Arrange to have NEMMA profiled in relevant resource user targeted publications such as the Antigua and Barbuda Marine Guide, the Yacht Cruising Guide for the Leeward Islands and on the websites of the Government and the Antigua and Barbuda Marine Trades Association		04/08		
h)	Produce a promotional video on NEMMA for marketing at international tourism trade shows			12/09	
i)	Launch of an OPAAL/NEMMA media award for outstanding coverage on Marine Protected Areas			12/09	

Guidance on the communication requirements of the NEMMA, including key messages appropriate to different media is given in the Communications Plan prepared for this site by the OPAAL project (Fontenard, 2007).

7.2.2 Subprogramme 2B: Livelihood Development and Sustainability

7.2.2.1 Objectives

- Support and develop compatible uses within the NEMMA
- Provide Education and technical support to micro-enterprises operated by community groups

7.2.2.2 Activities

Activity (Subprogramme 2B)		Timeline			
		2007	2008	2009	2010
a)	Negotiate access to credit for community micro-enterprises			10/09	
b)	Provide technical support for marine based enterprises, such as seamoss farming			06/09	
c)	Establish and maintain a registry of micro businesses support by resources of the NEMMA; maintain contact & monitor beneficial or adverse impacts from management rules applied in the NEMMA		06/08		
d)	Conduct study to more specifically define opportunities for new or alternative livelihoods and estimate demand levels for each area, e.g. in collaboration with Min. of Tourism		06/08		
e)	Provide training for alternative livelihoods for fishers and other stakeholders (inc. navigation, boat handling, tour-guiding, salt-water fly-fishing tourism)		10/08		
f)	Develop trails within NEMMA to attract visits of tourists and thereby support associated livelihoods, and provide training of tour guides.			10/09	

7.3 Programme 3: Administration and Finance

7.3.1 Subprogramme 3A: Management and Operations

7.3.1.1 Objectives

- To provide an efficient organization and the technical and administrative capacity to achieve the objectives and vision of the NEMMA

7.3.1.2 Activities

Activity (Subprogramme 3A)		Timeline			
		2007	2008	2009	2010
a)	Obtain legal assistance in drafting the Articles of Association of the Management Partnership		09/08		
b)	Draft an adopt Membership Criteria		09/08		
c)	Register the Management Partnership		10/08		
d)	Establish the Board of Directors in accordance with the Articles of Association		10/08		
e)	Undertake staff orientation and establish office procedures		12/08		
f)	Develop a profile of NEMMA Management Partnership members to ascertain their capacity to provide technical and other forms of support to the NEMMA Office; such support could be voluntary or paid			06/09	

7.3.2 Subprogramme 3B: Finance

7.3.2.1 Objectives

- Provide capable and transparent financial management of the affairs of the Management Partnership in a transparent and timely manner
- To ensure that the NEMMA Partnership achieves and maintains self-sufficiency

7.3.2.2 Activities

Activity (Subprogramme 3B)		Timeline			
		2007	2008	2009	2010
a)	Engage technical assistance in the development of a Business Plan		10/08		
b)	Plan and manage discussions leading to decisions on revenue options to be pursued, along with license and user fees to be charged for operating in or using the NEMMA		12/08		
b)	Prepare annual budgets, inclusive of projections on expenses and revenue		06/08	06/09	06/10
c)	Prepare monthly statements expenses and revenue				
d)	Manage the accounts using procedures that allow for hassle free auditing				
d)	Prepare and submit proposals for grant funding				

7.3.3 Subprogramme 3C: Training

7.3.3.1 Objectives

- To build the capacity of NEMMA staff to carry out administrative technical and line functions
- To provide opportunities where possible for the training of staff and volunteers from partner of stakeholder organizations

7.3.3.2 Activities

Activity (Subprogramme 3C)		Timeline			
		2007	2008	2009	2010
a)	Provide initial in-house training to staff and Board Members on strategic planning and organizational governance			03/09	
b)	Train all staff in the essentials of tour guiding			06/09	
c)	Train all staff in first aid and life saving skills			06/09	06/10
d)	Train wardens in seamanship, boat handling and enforcement skills			08/09	
e)	Provide for ongoing training of staff in relevant skills required to run the operations of the NEMMA Office, including basic and specialized computer programs, data management, book keeping, customer relations				
f)	Train NEMMA staff and volunteers in administering visitor satisfaction surveys			12/09	

8.0 MANAGEMENT FRAMEWORK

8.1 Composition, Mandate and Functions of NEMMA Management Partnership

8.1.1 Composition

Management of the NEMMA is delegated to a not-for-profit company, called the NEMMA Management Partnership, established under the Company Law of the country. The NEMMA Partnership will comprise stakeholders to be known as Members of the Partnership. Persons eligible for membership include relevant government agencies (Departments, Divisions, Corporations or Statutory bodies), bona fide private enterprise associations, non-profit environmental and developmental organizations with memberships, and active voluntary community groups. Members will function as “shareholders” of the Management Partnership and will include the entities listed below. Additional entities are to be added from among eligible applicants:

- Government Agencies and Statutory Bodies
 - Fisheries Division
 - Forestry Division
 - Environment Division

- National Parks Authority (NPA)
- Department of Tourism or Tourism Authority
- Development Control Authority
- Hotel Association
- Representative of Tour Operations
- Environmental Awareness Group (EAG)
- Antigua/Barbuda Fisheries Alliance
- Representatives of Community Groups

8.1.2 Board of Directors

NEMMA Members will elect a Board of Directors at its Annual General Meeting (AGM) using procedures to be set out in the Articles of Association of the Management Partnership. Officers of the Board (Chairman, Treasurer and Secretary) will be elected or appointed by the Board as specified in the Articles.

The Board of Directors will function to provide policy direction and oversight for the area's management.

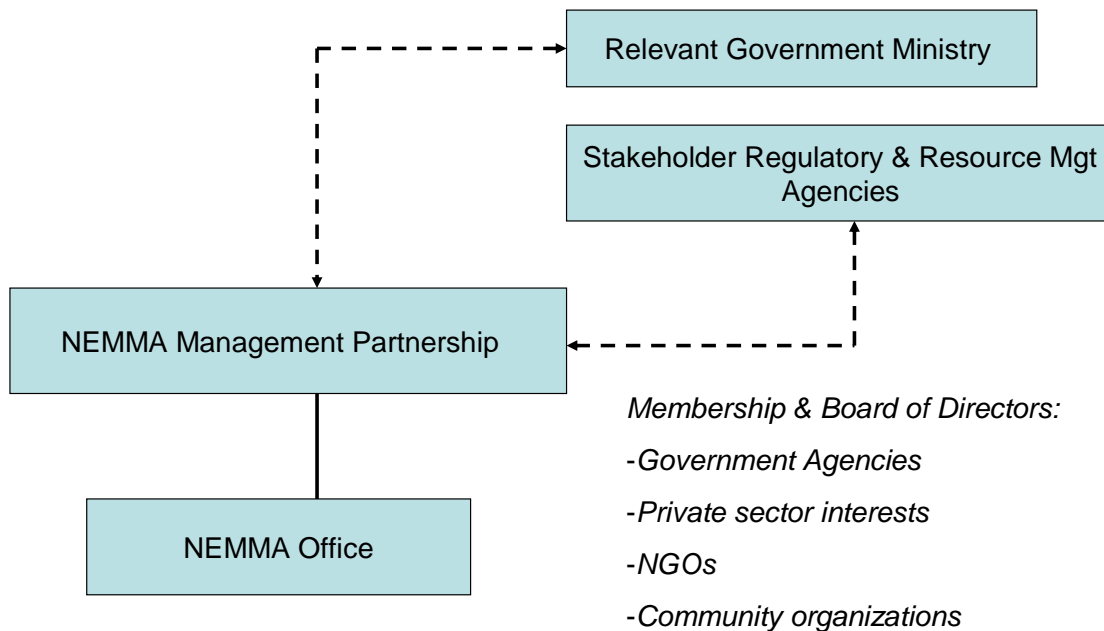
8.1.3 NEMMA Office

A NEMMA Office answerable to the Board will provide executive functions for the Partnership and will have responsibility for:

- Revenue collection
- Education and awareness
- Infrastructure development, including reef markers, boat moorings (yachts, tour and dive boats),
- Underwater trails
- Garbage collection
- Interpretation
- Visitor data

The Office will be headed by a Manager, who will supervise a compliment of staff as described in Section 13 of this Management Plan. Other services vital to the management of the NEMMA will be outsourced as needed. These could include Business Planning, Auditing, installment of fixed moorings, moorings maintenance.

Figure 8.1: Simplified Structure NEMMA Management



8.1.4 Role of Resource Management or Regulatory Agencies

Partners with statutory or administrative responsibilities for resource management, issuing of planning permits or development control will continue to exercise these functions within the NEMMA. In some cases, statutory authority may need to be clarified to avoid conflicts between the Management Partnership and regulatory bodies. The Management Partnership will seek legal advice in seeking clarity on statutory matters.

8.2 Role of the Ministry of Agriculture and Fisheries

Since the NEMMA was established as a Marine Reserve under the Fisheries Act, 1983, the responsible Minister under the Act, the Minister of Agriculture and Fisheries will have ultimate responsibility for the management of the area in accordance with the Act. In this case the NEMMA Management Partnership is expected to function in principle as a statutory body with similar autonomy.

8.3 Management Procedures

Procedures governing the conduct of the NEMMA Board and Membership shall be set out in the Articles of Association to be tailored by a legal expert with the input of the Ministry of Agriculture and Fisheries and various other stakeholders. Procedures should cover:

- Membership eligibility
- Membership application
- Timing and announcement of AGM
- Voting rights of Membership
- Voting rules
- Election of Board Members and Officers of the Board
- Rotation of Board Members
- Ordinary and extraordinary meetings
- Notice of meetings
- Records of meetings
- Role of the Chairman, Secretary and Treasurer
- Period of the Financial Year
- Approval of annual operating budgets
- Audit rules
- Appointment of NEMMA Manager and other staff

9.0 MONITORING AND EVALUATION

9.1 Approach

Monitoring and evaluation (M&E) for management effectiveness should be spearheaded by the NEMMA office and done with the involvement of NEMMA partners and/or stakeholders. The OECS Scorecard for M&E management effectiveness (adapted from the WWF-World Bank Alliance Scorecard) could provide the framework for M&E. The following subsections suggest indicators that could be used to provide quantitative guidance on each of the scorecard sections. M&E participants should be trained in applying the scorecard.

The effectiveness of management will to a large extent depend on the ability to change human practices and build public support for management objectives, programs and rules. Continuous dialogue with resource users and/or property owners is essential in achieving compliance with rules. Since compliance is critical to management effectiveness, the approach to be used in building public support should involve a process that includes three elements: stating the rules, collecting information to determine the effectiveness and fairness of rules and making adjustments:

a) Stating the Rules

Management rules, standards or desirable best practices should be clearly stated in simple language and publicized for the benefit of resource users and visitors to the NEMMA. Reliable scientific and local knowledge should be used in applying resource based rules. Rules affecting the management of visitors should be informed by ‘best practices’ adopted from successful management experiences from other countries.

Key members of the partnership or other vested interests should be called upon to assist in awareness building among resource users and visitors of rules and standards; for example, the Cruise Tourism Association with respect to cruise lines and cruise passengers, Antigua and Barbuda Marine Trades Association, for yachts and yacht passengers, Antigua/Barbuda Fisheries Alliance for fishermen, Association of Tour Operators for tour operators and tour visitors, and community organizations for residents.

A “hard and fast” application of all rules and standards should not occur in the formative years of management. Rather, flexibility should be used, while public support for management objectives and rules is built through awareness. Support building through awareness is preferred to the dependence on penalties to achieve compliance; the latter is best applied when the former proves ineffective.

b) Information Gathering for Monitoring the Application of Rules and standards

The NEMMA Management Partnership and its Office with support from its membership will apply various methods to gather information, which will be used in deciding where adjustments are required to ensure rules are fair and effective in achieving desired outcomes. Agreed monitoring methods may be quantitative or qualitative, simple to apply as a rule of

thumb and where complex, must be within the competence of staff where performance must be measured or interpreted. It is important to determine who should be involved in data gathering measures to be used, how results are to be analyzed, the frequency of analysis and who should be involved in meetings leading to decisions on agreed adjustments.

Daniel Hoggarth of Scales Inc., (2002) in the 2002-2006 Management Plan for the Soufriere/Scotts Head Marine Reserve in Dominica suggested an adaptive management approach adopted from an IUCN framework for information gathering in matters of performance to be monitored.

c) Making Adjustments

Monitoring results should be used to modify rules as needed. Where the expected results of rules have not been obtained, consultations and brainstorm sessions should be used to determine why not. Such sessions can help to determine if standards should be tightened or relaxed, or if additional resources should be placed in education and awareness, enforcement or protected area infrastructure.

9.2 Evaluation Indicators

The M&E Scorecard evaluates management effectiveness by seeking answers to questions in six (6) areas:

9.2.1 Context

In this case, the evaluation must seek to assess existing critical resource threats and the policies and practices being applied to address them. Priority is to be given to threatened resources including:

- The Antiguan Racer Snake, the endemic and threatened reptile, threatened by invasive species (particularly black rats) and human activity
- Living reefs populations, affected by boat anchors and discharges, snorkeling, fishing methods
- West Indian Whistling Duck, a uncommonly sighted bird, affected by egg collection, boat and human traffic
- Low abundance and diversity in fish populations, an example being the threats posed by high levels of export of Parrot fish

Critical attention must also be paid to the adequacy of policy and regulatory environment to address the threats to resources by seeking answers to relevant questions about:

- The adequacy of existing laws and regulations to control human activity and reduce human threats
- The levels of awareness of resource users about the levels of threats, boundaries of the NEMMA, no take zones, etc.

The desired state of affairs to be achieved by management includes:

- Stable populations of the Racer Snake and Whistling Duck
- Stabilization or improvements in live reef cover
- Maintenance of reef health, with particular attention given to the staghorn coral species
- Increase in the population of West Indian Whistling Duck
- Increase in abundance and diversity of fish populations

Indicators of management performance would therefore include:

- Continued decrease in the rat populations; increase in the population of the Racer Snake to levels that are sustainable
- Adequate maintenance of forest cover critical to the population of the snake and other reptiles
- Regulations that adequately govern undesirable human practices are in place with fair penalties that help to deter infractions
- Staff, boats and equipment are adequate to provide effective surveillance and enforcement
- Public education and awareness outreach is designed to target various stakeholder and community groups

9.2.2 Planning

This aspect of M&E seeks to determine what should be done to achieve the desired state of affairs (where does management want to be) by assessing design and planning actions already taken for the NEMMA. The M&E is to be applied in carrying out the assessment but the following important tasks should be carried out to determine:

- If management is succeeding in achieving the vision and objectives of the NEMMA
- If the Management Plan is helping to provide needed guidance
- What planning initiatives have been taken to resolve use conflicts and capacity issues in resource sensitive areas of the NEMMA

The desired state of affairs may include:

- Reduction in conflicts linked to overcrowding at Great Bird Island
- Key wildlife habitats are being restored
- Actual and perceived overcrowding of visitors at popular sites no longer occurs
- Litter and waste disposal problems at popular recreation sites are resolved
- Shoreline uses and development have become less of a threat to water quality in the NEMMA

Indicators of management performance would include:

- Tour boat trips are being staggered to avoid overcrowding
- Fixed moorings and/or floating jetties have been installed and used by tour boats

- Alternative sites for recreation are being used to reduce overcrowding
- New attractions are developed and used in a sustainable manner to accommodate additional visitors to the NEMMA
- Adequate control over land based discharges and sediment deposition is occurring
- Snorkel trails have been used to reduce impacts from snorkelers

9.2.3 Inputs

This element of M&E should involve an assessment of the resources needed to achieve more effective management. The Scorecard can be used to guide the assessment but critical attention should be paid to:

- The relevance of survey and research projects in achieving management effectiveness
- The adequacy of staff and budget in implementing management programs

The latter requires the necessary commitment from government. Measurement of commitment can be made against realistic targets for the plan period which could be stated as described:

- at least 75% of all key staff are recruited, employed and functioning in the positions, adequate capital investment in equipment and infrastructure has been made and the operational budget sufficient for the implementation of various programs
- Agreed revenue measures are implemented and used towards ensuring the desirable state of self –sufficiency of the Management Partnership

With these in mind, the relevant questions become obvious:

- How many of the agreed staff positions have been filled?
- What is the gap between the required capital and operating budgets and revenues being generated?
- How much of the agreed revenue measures have been implemented in placing the Management Partnership in the desired state of self-sufficiency
- How many proposals have been written to secure grant funding?
- What is the rate of attendance of Board Members in meetings?
- What is the size of the membership of the Partnership and membership attendance at Annual General Meetings?

9.2.4 Process

This is an important element of M&E, which assesses how management is being conducted. A determination must be made on the effectiveness of procedures used to conduct management affairs and to get things done. The assessment should include:

- Mechanisms used for involving community groups and other stakeholders in decision making
- Measures used in public education and awareness
- Procedures used to achieve desired results from meetings, training, reporting, maintenance, expenditure control and delivery of visitor services, etc.
- Procedures used to achieve policy dialogue between Government and the NEMMA Management Partnership
- Measures taken to obtain visitor satisfaction with services and facilities

Indicators of management performance would include:

- Evidence of an increase in the numbers and/or size of communities actively involved in NEMMA affairs
- Frequency in the use of workshops, radio, televisions and other media to target resource users, community groups and potential visitors to the NEMMA
- Evidence of minutes of meetings circulated routinely to Board members and/or NEMMA Partners in accordance with the Articles of Association that governs the affairs of the NEMMA Partnership
- Evidence of audited financial reports, research and other progress reports circulated to NEMMA Membership in accordance with the Articles
- Government actions that indicate adequate response to proposals by the Management Partnership for shifts in policy critical to improved management effectiveness
- Visitor satisfaction surveys are conducted on a regular basis and results used for improvements in the quality of the visitor experience

9.2.5 Outputs

This aspect of M&E assesses the results of the implementation of management programs and actions in the delivery of goods and services. Evaluators should reference the Scorecard for guidance monitoring and evaluating this aspect of management effectiveness. Critical results should include but not limited to:

- The adequacy of visitor facilities and other infrastructure, e.g, signs, toilets, trails
- Safety in the operation of boats, vehicles
- Levels of security

- Effectiveness of revenue collection and meeting of expenditure targets

9.2.6 Outcomes

Achieving desired outcomes is considered the true test of management. This aspect of the evaluation seeks to determine the extent to which management objectives have been or are being achieved. The M&E Scorecard suggests that relevant questions to be asked should be what have been done to:

- Protect the biodiversity of the area
- Provide opportunities for scientific and socio-economic research, and for monitoring the impact of uses and management actions
- Maintain the quality of coastal waters
- Preserve and enhance the natural scenery and beauty of the area that are inherent in the relationships between land and seascapes
- Promote and manage tourism and recreational uses
- Provide public education, awareness and appreciation of the area's heritage
- Sustain traditional uses and livelihoods
- Promote economic and social benefits at the community and national levels

9.3 Research

The NEMMA Office will be responsible for coordinating research activities of the NEMMA, under the guidance of a Research and Monitoring Committee of the NEMMA Board. In this regards it will:

- In consultations with members of the Management Partnership development a Research and Monitoring Plan for the NEMMA
- Design, development and manage with technical assistance where necessary, a data base of scientific and socio-economic data for the area; data base design should include procedures for data input and access by members of the Management Partnership and approved other stakeholder agencies, NGOs and private sector associations
- Publish research findings at regular intervals
- Provide opportunities for schools and students to access data for research projects, including dissertations
- Facilitate and manage requests by local and external institutions for undertaking research projects in the area; establish procedures to ensure that findings are shared with the NEMMA Management Partnership

10.0 ZONING PLAN

10.1 Existing Uses

The NEMMA is a multiple use area. Major use categories include:

- Research and Education
- Fishing (pot, net, line)
- Recreation, including water sports such as kayaking, snorkeling, scuba diving, water skiing, jet skiing, hiking,
- Resort and residential
- Yachting
- Industry and Commerce
- Marine Transportation and shipping
- Resort & residential

10.2 Spatial Distribution of Uses

An inventory of uses has been done to inform zoning. A summary of uses by selected areas is provided in Appendix 3.

10.3 Existing Zones

Since the establishment of the NEMMA as a marine reserve no zones have been demarcated within its boundary. The NEMMA is quite large and presumably contains areas that could be designed under other management categories provided for in the Fisheries Act. Under Section 19 (a) the Minister can designate a Local Fisheries Management Area (LFMA) and under Section 19 (b) a Fisheries Management Authority (FMA) for that area.

The FMA is given the authority to make by-laws (not inconsistent with the Act) regulating the conduct of fishing operations in the LFMA, although the specific objectives for doing so are not detailed in the law. Section 21 allows the designation of Fisheries Priority Areas (FPAs) to ensure that authorized fishing is not impeded or interfered with.

It is critical to note in the application of zoning that marine reserves can be declared from “any area in Antigua and Barbuda waters.... and any adjacent or adjoining land..”. The NEMMA has thus been designated to include all the offshore islands shown in Appendix 1.

10.4 New Zones

10.4.1 Zoning Designations

The list of all zoning categories (existing and new) or the NEMMA, along with their zoning objectives, are listed in Table 10.1. Uses allowed in the various zones are indicated in Table 10.2. For the purpose of this management plan, only two core areas of the NEMMA have

been zoned. These are the Great Bird Island Core and Green Island Core and are shown on Figures 10.1 and 10.2 respectively.

Table 10.1: Zoning Designations and Zoning Objectives

Zoning Code	Zone Designation	Zone Objectives
M1	Conservation	To protect flora and fauna, (particularly those that are endemic, threatened, or “in danger of extinction”), “natural breeding grounds and habitats of aquatic life” and promote “scientific study and research” important to their protection
M2	Recreation	To provide opportunities for recreation and tourism activities consistent with the conservation of natural resources of the NEMMA and objectives for sustaining livelihood and economic activities
M3	Fishing Priority Area	To maintain fishing opportunities and livelihoods compatible with the sustainability of fishery resources
M4	Yacht Mooring Zone	To allow the anchoring of charter and cruising yachts in popular anchorages of the NEMMA critical to deriving economic and social benefits from the yachting sector
M5	Resort/Residential Zone	To accommodate existing and planned resort and residential uses on appropriate offshore islands of the NEMMA consistent with the protection flora, fauna and other resources of the NEMMA
M6	Port/Harbour	To allow the continuation of commerce, marine transportation, shoreline industrial activities in the port of Parham Harbour and Crabbs Peninsula consistent with the protection of marine and other natural resources
M7	Multiple use zone	To allow multiple uses to coexist without conflict in a manner consistent with the conservation of natural resources of the NEMMA
M8	Local Fisheries Management Area	To allow the designation and use of Local Fisheries Management Areas (LFMA) as provided for under the Fisheries Act

Table 10.2: Allowed Uses in NEMMA Zones

No	Use Category & Type of Use	Zones							
		M1	M2	M3	M4	M5	M6	M7	M8
1	Monitoring and Research								
a)	Research	■	■	■	■	■	■	■	■
b)	Surveillance	■	■	■	■	■	■	■	■
c)	Sediment sampling	■	■	■	■	■	■	■	■
2	Recreation								
a)	Swimming		■		■		■	■	

b)	Snorkeling		■		■			■	
c)	Diving				■		■	■	
d)	Kayaking		■		■		■	■	
e)	Tour boat anchoring		□				■	■	
f)	Tour boat mooring				□		■	■	
g)	Skiing		□					■	
h)	Windsurfing		□					■	
i)	Hiking	□	■			■			
j)	Camping	□	■			■			
3	Fishing								
a)	Pot fishing			■				■	
b)	Net fishing			■				■	
c)	Line fishing		□	■	□		■	■	
d)	Spear fishing								
4	Yachting and Boating								
a)	Marinas						■	■	
b)	Yacht anchoring						■	■	
c)	Yacht mooring		■	□	■		■	■	
d)	Tour boat anchoring		□				■	■	
e)	Jetty construction		□	□	□	□	■	□	
f)	Live aboard yacht							■	
g)	Yacht/boat hurricane shelter	■					■	■	
5	Tourism/ Residential								
a)	Hotel					■		■	
b)	Residence					■		■	
c)	Dredging			□		□	□	□	
d)	Excavation			□		□	□	□	
e)	Restaurant					■	■	■	
6	Commercial/Industrial								
a)	Ship berthing						■		
b)	Ship anchoring						■	□	
c)	Hauling of fishing boats			■		□	■	■	■
d)	Anchoring of fishing boats		□				■	■	■
e)	Wastewater discharge		□	□	□	□	□	□	□
f)	RO/Desalt plant waste discharge				□		□	□	□
M1	Conservation Zone								
M2	Recreation Zone		■ By right □ By exception						
M3	Fishing Priority Area Zone								
M4	Yacht Mooring Zone								
M5	Resort/Residential Zone								
M6	Port/Harbour Zone								
M7	Multiple-use Zone								
M8	Local Fisheries Management Area Zone								

10.4.2 Great Bird Island Core

The approximate boundary of the Great Bird Island Core area has been demarcated and must be reviewed and adjusted during the plan period as appropriate. Four (4) zones are designated for the area:

- M1: Conservation zone which includes Great Bird and all other islands in the core. Hiking and bird watching are allowed and other recreational uses requiring strict management controls. Note that Long Island is not considered part of the Great Bird Island Core. The marine areas to its east, northeast, north and northwest are considered part of the Core and are designated M1 mainly for the conservation of Acropora species of corals (Elkorn and Staghorn corals) and for research associated with conservation of biodiversity; research and conservation activities associated with the Hawksbill turtle at Pasture Bay also gives this area additional significance
- M2: Recreational zone, representing along with the Conservation zone one of the largest (if not the largest) zones of the core; notwithstanding the recreation designation, management emphasis should be on sustainable use and conservation of reefs, sea grass, mangroves and other resources
 - Tour boats and yachts using this area must moor on fixed moorings
 - This regulation is to be gradually phased in, during which time all yachts must anchor in a prescribed area to be identified by NEMMA staff in consultation with users of the area
 - At the end of the phase in period, no anchoring will be allowed in the M1 zone
- M4: Yacht mooring zones; two (2) are designated to accommodate yachts for both day and night time mooring in conventionally used, relatively well protected anchorages
- M5: Resort/Residential: This area covers Long Island which is zoned at this time because it fringes the Core area; it is designated M5 on account of existing residential and resort uses
- M7: Multiple use zone: this zone requires less management control and has fewer restrictions

10.4.3 Green Island Core

The approximate boundary of the Green Island Core area has been demarcated and must be reviewed and adjusted during the plan period as appropriate. Three (3) zones are designated for the area:

- M1: Conservation zone which includes Green Island and Bird Island; this is a small island in Nonsuch Bay, north of Green Island and should not be confused with either Great Bird or Little Bird islands of North Sound; conservation management of Green Island, require an agreed partnership arrangement.
- M2: Recreation zone, representing the largest area of the Core; while recreational uses, including snorkeling, are encouraged in this zone, the barrier reef (Bird Island North and South reefs) is to be provided maximum protection to sustain biodiversity and its immense value in the protection of Nonsuch Bay
- M4: Yachting zones; permanent moorings will eventually be used in three (3) popular anchorages in the Core to control the number of yachts using the area, reduce threats to the substrate and help sustain ambient water quality; these are Rickett Harbour, Tenpound Bay and the anchorage west of Bird Island Reef South; the NEMMA Management Partnership will tender for proposals for a service provider to install and maintain the moorings and offer them at an approved mooring fee as a concession.

10.4.4 Zoning Methods and Process

a) Methodology

New zoning categories are justified due to the size of the NEMMA and range of uses that must be maintained within its boundaries. The basic principles for zoning terrestrial or marine areas are to avoid use conflicts, promote mixed or multiple uses which can coexist without conflict and to ensure that uses are compatible with resource conservation. The methodology used sought to blend the approaches to zoning used for Soufriere Marine Management Area (SMMA), St. Lucia and Soufriere/Scotts Head Marine Reserve, Dominica with practices in land based zoning. In the SMMA, five (5) zoning categories are used: Marine Reserve, Fishing Priority Area, Recreational Area, Yachting Area and Multiple Use Area.

b) Process

Zoning of the NEMMA requires more time and resources than were available for the preparation of this Management Plan. Follow-up actions should be guided by a process that involves:

- Additional stakeholder review of the zoning designations
- Application and testing of the zoning designations proposed for the Great Bird Island and Green Island core areas
- Additional biological and socio-economic surveys of NEMMA resources as required to develop a higher resolution map of marine habitats, including biodiversity hotspots, and the use of such areas by fishers. This survey work should be led by local experts.
- Zone designations for other parts of the NEMMA, informed by the above actions

- Use of digital aerial photographs for mapping of zones with a GIS application that allows easy modification or changes to zones; (attempts to secure aerial imagery from the Survey Department was not successful)
- The participation of key resource users and other stakeholders in review, application and testing exercises
- Legislative review and changes necessary to apply the new zoning designations

11.0 MANAGEMENT REGULATIONS

Management regulations do not exist for some of the uses occurring within the NEMMA. They exist for fishing but not generally for watersports and yachting activity. Selected activities regulated for fishing are described below. Examples of uses to be regulated in other areas are also noted. Fisheries Regulations of 1990 have been updated in the new Fisheries Regulations, 2007. Regulations governing other uses require drafting, stakeholder review and passage into law. This is an important activity identified in the Management Plan.

11.1 Watersports

This is a critical activity which needs to be regulated. Examples of relevant matters to be addressed are:

- Operators of watersports activities must register with the Management Partnership and obtain a license to operate within the NEMMA; this applies to kayak operators, boat tours, day charter boats, dive tour operators
- All persons purchasing a tour with a licensed watersports operator must obtain a user permit and pay a user fee
- Tour boats are prohibited from anchoring in designated popular tour destinations (to be named) except with the use of fixed moorings

Figure 10.1: Zone Designations, Great Bird Island Core

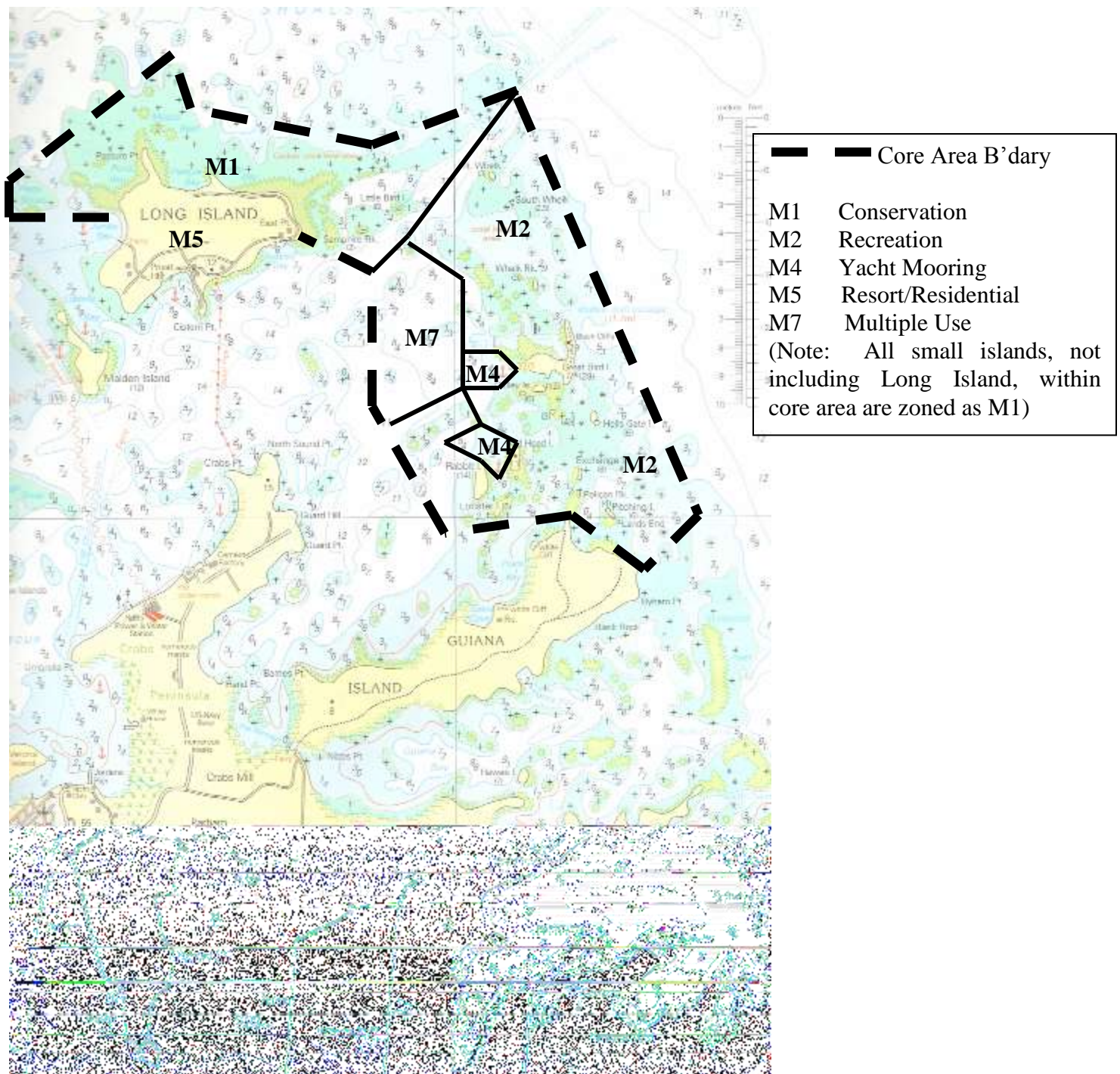
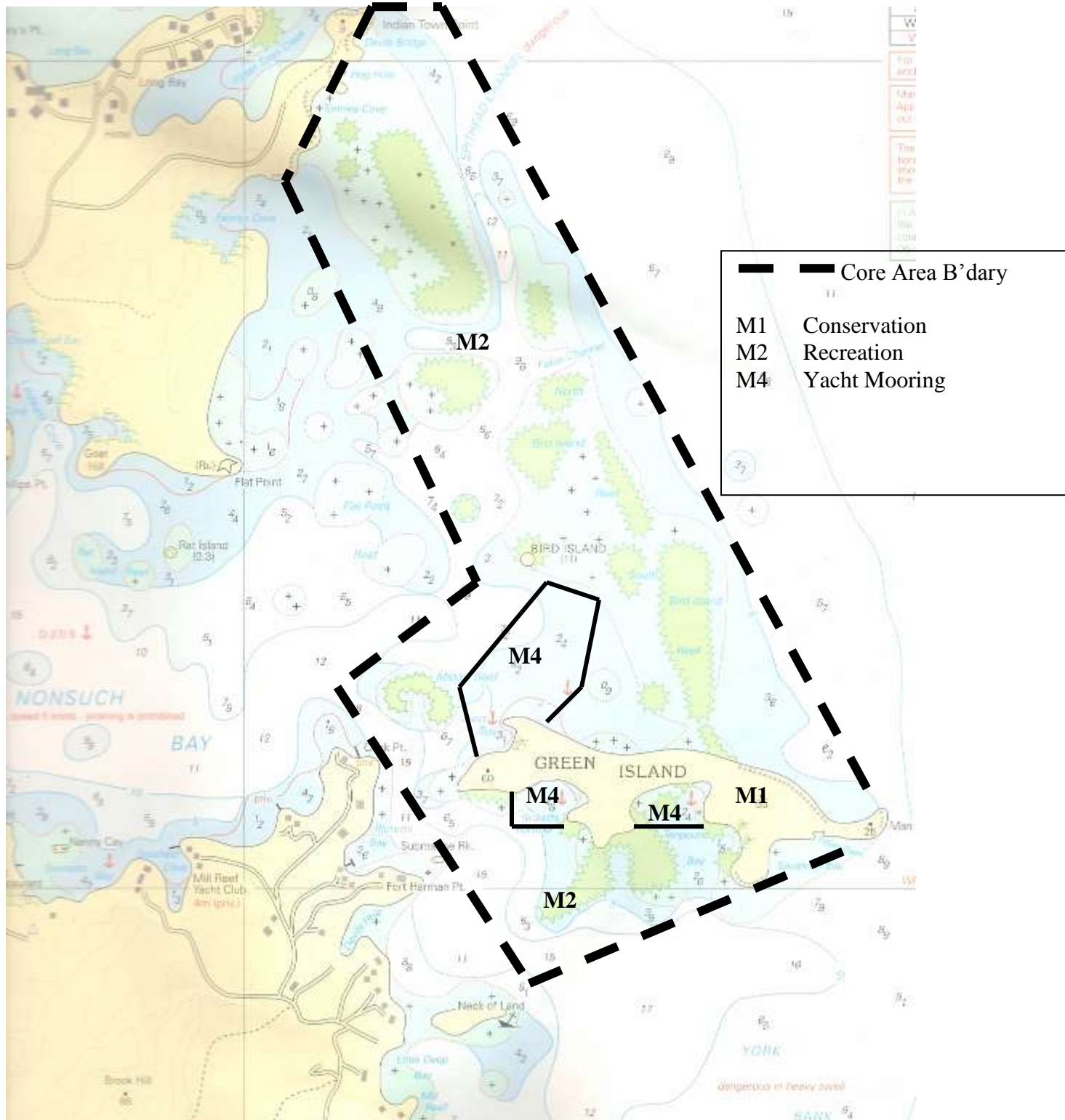


Figure 10.2: Zone Designations, Green Island Core



11.2 Fishing

Fishing is regulated by the updated Fisheries Regulations, 2007. Part VI, Fisheries Conservation Measures provides regulatory authority over lobsters, turtles, conch and corals. These regulations will be enforced for the NEMMA by Wardens using powers delegated to them by the Chief Fisheries Officer. Samples of regulatory authority under the Fisheries Act and Regulations are provided:

- No foreign fishing vessel shall be used for fishing or related activities in Antigua and Barbuda Waters without a valid foreign fishing license (Section 8 (1) of the Fisheries Act 2006)
- No local fishing vessel shall be used for fishing or related activities in Antigua and Barbuda waters without a valid license (Section 11 (1) of the Fisheries Act 2006)
- Permission to fish and to take flora or fauna from the NEMMA marine reserve must be given by the Minister or by a person authorized by him/her (Section 22 (2))
- No person shall use a spear gun for fishing in the waters of Antigua and Barbuda, without having first obtained the written permission of the Chief Fisheries Officer, Fisheries Regulations 2007 Section 25 (1)
- No person shall take or collect coral.... without the written permission of the Chief Fisheries Officer (Fisheries Regulations 2007, Section 23)
- No person shall take or sell an immature conch (with shell less than 7 inches in length (Fisheries Regulations 2007, Section 22)
- No person shall sell, purchase or have in their possession any undersized turtles (Fisheries Regulations 2007, Section 21); undersize is defined for Leatherback turtles (*Dermochelys coriacea*) as being less than 350 pounds in weight; for Green Turtle (*Chelonia mydas*), less than 180 pounds; Hawksbill turtle (*Eretmochelys imbricate*) less than 85 pounds and for Loggerhead turtles (*Caretta caretta*) less than 160 pounds
- No person shall harm, take, sell or have in their possession Spiny lobsters (*Panulirus argus*) that are undersized, carrying eggs or that are moulting; the term undersized is defined in the regulations

The regulations also set out close seasons during which no harvesting of conch, lobster or turtles are allowed.

The new Fisheries Regulations of 2007 expand regulatory authority making it necessary for:

- the Minister or Chief Fisheries Officer to grant permission to
 - establish artificial reefs and fish aggregation devices
 - use a beach seine

- collect cockles
- the Minister to declare any area of Antigua and Barbuda waters and any adjoining land to be a turtle nesting area, in order to provide special protection to turtles and turtle eggs

During the most recent stakeholder consultation, February 23, 2007, participants in one of the working groups suggested the need for a policy that encourages the use of environmentally friendly equipment (such as engines) and for regulations governing activities in regeneration areas of significance to fishing.

11.3 Yachts

Yachting uses, in addition to those described below, will require like watersports activities a complete set of regulations

- All yachts entering the NEMMA must first obtain a permit and pay a user fee per passenger in doing so
- Yachts are not allowed to anchor in areas designated for use of fixed moorings
- All yachts using fixed moorings must pay a nightly user fee

11.4 Camping and other Land-based Recreation

Stakeholders concerned with current and future impacts of camping, hiking, vending and other related visitor activities on the Antiguan Racer Snake and nesting birds were quite vocal in emphasizing the need for management regulations governing:

- Location and use of camp sites on Great Bird Island, including requirements for obtaining a permit
- Storage and removal of garbage by campers
- Use of portable toilets by campers
- Material used for cooking and fires lit for any other purpose
- Practices of hikers on trails; particularly measures to restrict the wandering of persons into critical habitat areas of the Antiguan Racer Snake and nesting birds
- Contact with and illegal taking or exporting of flora and fauna

11.5 Buildings and Infrastructure

Buildings and projects affecting the environment are somewhat regulated in the application of Environmental Impact Assessment (EIA) procedures. NEMMA management interest could be served by the following requirement:

- Any person or company seeking to construct buildings or undertake any form of development as defined in the Planning Act in the NEMMA must submit a copy of the plans submitted to the Development Control Authority for Review and Approval of the NEMMA Office acting on behalf of the NEMMA Partnership

The Fisheries Act 2006 gives the Minister the authority to grant permission for the construction, sand extraction and other matters related to new developments. However, regulations are needed to clarify procedures and ensure inter-agency cooperation in management. Stakeholders at a meeting to review the draft management plan endorsed a recommendation for the requirement of periodic environmental audits of existing hotels and manufacturing operations within the NEMMA or adjacent to its shoreline. Regulations governing the condition under which the audits should occur, their timing, scope of investigation and compliance with required mitigation would be needed to provide the legal authority for enforcement of the Environmental Audit procedure.

11.6 Resource Extraction and Pollution

The Fisheries Act 2006 gives the Minister authority over dredging, extracting and polluting activities; specifically, Section 22 (2) (c) states:

- Any person, in any marine reserve....dredges, extracts sand or gravel, discharges or deposits waste or any other polluting matter, or in any way disturbs, alters or destroys the natural environment...is guilty of an offence

Regulations governing dredging, extraction, discharges and pollutants must be made more specific with respect to procedures for collaboration between agencies with overlapping responsibilities: example, the Central Board of Health (CBH), the Environmental Division, DCA and Forestry Division. The Draft Antigua and Barbuda Environmental Protection and Management Bill to be administered by the Environmental Division (upgraded into a Department) seeks to address uses occurring within or affecting the NEMMA, including new projects, hazardous substances, solid waste and other pollutants, and water quality. Further overlapping of agency responsibilities will occur and perhaps can be resolved where necessary through the respective involvement of these agencies in the NEMMA Management Partnership.

During discussions that occurred in the review of the draft NEMMA management plan, stakeholders also emphasized the need for applying measures for soil and water conservation for watersheds or drainage basins discharging into marine areas of the NEMMA. Practical measures can be incorporated into regulations governing common practices such as:

- Vegetation clearing and removal

- Excavation associated with road and building construction and related site works
- Fertilizers and chemicals used for resort and residential landscaping
- Storm water drainage
- Storage and disposal of fuels, oils, paints, solvents and chemicals used for swimming pools, gardening, boat maintenance and repairs, and various other industrial applications

11.7 Standards

Existing regulations are mainly designed and enforced for resource conservation and protection. It is important that standards are adopted and enforced as regulations to promote the safety, general well being and enjoyment of visitors to the NEMMA. Critical areas to be addressed include:

- Safety in relevant areas
 - life vests and adequate communications equipment for boats
 - control of boat speeds for commercial operators (this is also a requirement in reducing impact of prop wash or boat wake on shorelines)
 - risks associated with the use of hiking trails, walking next to or viewing areas from cliffs or vulnerable landscapes
- Security, i.e., arrangements that reduce the vulnerability of the visitor to theft, robberies, assault and other crimes; NEMMA management would be expected to make adequate security arrangements for Great Bird Island and other popular visitor attractions
- Sanitation, including food preparation, handling and storage by vendors or tour operators and adequate toilet facilities; Guidelines or standards used by CBH could be adopted for the uses or requirements
- Infrastructure design and maintenance, including trails, steps, jetties, ramps
- Interpretation to ensure adequate interpretation of NEMMA's natural and historic heritage
- Directional, information, warning and other signage required to maximize the quality of the visitor experience

12.0 ENFORCEMENT

12.1 Offences and Penalties

Contraventions of management rules must be addressed by:

- The Fisheries Act 2006 and the Fisheries Regulations 2007
- Physical Planning Act and its regulations or codes
- Other statutes that give regulatory agencies authority over the resources and uses of the NEMMA

Penalties for contravening these laws and regulations should apply for offences committed in the area. The scope of existing enabling laws does not provide for the enforcement of the range of management rules required to govern the multiple uses of the NEMMA. Legal deficiencies should be addressed. Two major actions must be taken early in the four year period of the Management Plan:

- i) legal review of statutory deficiencies that could adversely affect management
- ii) legal assistance to assemble and further develop a comprehensive package of relevant management regulations for the NEMMA

12.2 Authorized Officers

NEMMA Wardens will be designated “authorized officers” under relevant statutes for the purpose of carrying out their duties, including enforcement of management regulations. Other persons authorized by law to enforce the provisions of the Fisheries Act and Fisheries Regulations will also function to ensure compliance with the rules of NEMMA. Authorized Officers are to be provided with identification that can be produced on demand as evidence of their vested authority.

12.3 Powers of Authorized Officers

The powers of Authorized Officers will be as prescribed by the Fisheries Act and other relevant statutes from which their authority is drawn. A summary of their legally prescribed authoritative functions should be published for public knowledge. They are expected to include:

- Boarding and searching of vessels
- Examination of licenses and permits from tour operators, yachts, visitors or fishermen
- Seize in accordance with the law, vessels, gear or equipment used to commit an offence in the NEMMA

- Issue notice to stop any activity that may be in contravention of management rules, example anchoring in no anchor zones
- Collect user fees on behalf of the Management Partnership if requested to do so

12.4 Enforcement Procedures

Enforcement essentially comprises actions taken to ensure compliance with regulations. Emphasis is to be placed on prevention, thus the public is to be adequately informed about management rules. Wardens are to be trained in enforcement procedures by the Attorney General's office. An important aspect of this training should be to understand the rights of offenders. Another could be on the difference between civil and criminal offences.

The interpretation applied in dealing with enforcement for the Soufriere/Scotts Head Marine Reserve in Dominica is that civil court proceedings deal with disputes. One example could be over the non-payment of a fee. Civil action is then taken to resolve the issue (in this case to obtain payment) without punishment to the individual or company. In this interpretation a civil action can involve the issuing of an injunction or restraining order by the courts, in which case the NEMMA Management Partnership could submit a petition to the courts outlining the offences and resolution sought.

Criminal proceedings on the other hand deal with situations that are seen as crimes under the law and criminal sentences (fines or imprisonment) are dealt by the courts as penalties that act as a deterrent to other would be offenders.

Legal advice is to be sought by the NEMMA Management Partnership, so that procedures to be adopted in the enforcement of management regulations are clear, fair and correct in the rule of law.

13.0 ADMINISTRATION

13.1 Staffing

A provisional staffing package for the NEMMA has been devised to include the following positions:

- NEMMA Manager
- Administrative and Accounting Officer
- Research and Monitoring Officer
- Product Development and Interpretation Officer
- Education and Awareness Officer
- Public Relations, Marketing & Sales Officer
- Maintenance Officer
- Wardens/Rangers (6)

Staff requirements should be further evaluated with due consideration given to size of the NEMMA, resources and activities to be managed, levels of resource users and visitors, along with the technical, administrative and public relations skills that effective management of the area will require. At the very minimum, the NEMMA requires the services of a Manager, Education and Awareness Officer, Maintenance person and Wardens/Rangers at the inception of its management programme. Table 13.1 provides indicative monthly salaries for staff and a schedule for hiring persons to fill positions over the four year period of the Management Plan.

A flexible approach should be used to allow a realignment of staff functions to reduce some of the positions identified (if this is considered necessary for budget or other reasons) without sacrificing productive outputs required to achieve management objectives of such a large and heavily used area. Some functions of services could also be outsourced to small capable businesses and community groups where this leads to efficiency and cost savings in management and where this helps to build local support for management.

Staff responsibilities will be as described in Appendix 5.

Table 13.1: Monthly Salaries and Schedule of Employment, NEMMA Staff

Staff	Monthly Salary (EC\$)	Employment (Year)			
		07	08	09	10
▪ NEMMA Manager	5,000				
▪ Administrative and Accounting Officer	4,000				
▪ Research and Monitoring Officer	4,000 – 5,000				
▪ Product Development/Interpretation Officer	4,200				
▪ Education and Awareness Officer	3,500				
▪ Public Relations, Marketing & Sales Officer	4,000				
▪ Maintenance Officer	3,500				
▪ Wardens/Rangers (6) @ EC\$2,500	15,000				
Total	43,000 – 48,000				
<i>* Staff to be engaged on 3 year contracts; some to qualify for transport & duty allowance & gratuity as appropriate</i>					

13.2 Infrastructure and Equipment

13.2.1 Office Space

The Office of the NEMMA is to be temporarily housed at the Fisheries Complex on the Parham waterfront. Office equipment (computers, printers, filing cabinets, copying machine, etc.) are to be determined based on initial staffing and capacity of the allocated space. A similar determination is to be made on furnishings and office supplies, including computer software.

Parham waterfront is a major gateway to Long Island and Jumby Bay resort, other offshore islands and attractions in the NEMMA. It should therefore be considered for the permanent location of NEMMA's Office and Visitor Center. A possible site adjacent to the passenger jetty at the waterfront has been identified. Funding for a feasibility study and design concept is to be sourced to inform decision on the site's suitability and floor space requirements to accommodate the NEMMA Office and Visitor Center. The feasibility study will inform the design concept which will provide the necessary brief to the architect engaged for the final design of the building.

13.2.2 Transportation

Vehicle needs for transporting staff and to execute key functions such as surveillance, monitoring and research have been determined with due consideration for the size of the NEMMA. Initial requirements are:

- Two (2) boats over 27 ft, fully equipped as described below
- At least two (2) smaller boats less than 15 ft in length and shallow in draught to be used to access shallow and mangrove areas
- Two (2) vehicles; a 4 x 4 pick-up and a 4 x 4 jeep for overland travel and towing of trailers as necessary

Specifications and equipment to be considered in sourcing larger vessels are:

Length: 27 ft (8 meters); beam: 8-9 ft (2.5 meters)
20 Knots cruising speed
Center console, with windshield, bucket seat and Bimini top; stern seat
V hull Fiberglass with trailer
Self-bailing non-skid fiberglass floor
Live bait well; 120 quarts of fish storage with padded seat
Port & starboard navigational lights, stern light
Built in 100 gallon fuel tank with stainless steel fittings
Bilge pump
Anchor and chain, spare anchor
VHF radio
6 personal floatation devices (life vests)
First Aid kit, flare kit, fire extinguisher

Specifications for the smaller boats are:

Length: 15ft
Beam: 6 ft 6 inches
60 HP engine
Bimini or sun top
Fibre glass side console with storage

Fibre glass bench seat with storage
Removable forward bench seat
6 person capacity

13.2.3 Trails and other Infrastructure

Priority is to be given to infrastructure development on Great Bird Island in order to help reduce environmental impacts from existing high levels of use. Trails are to be improved and an effective programme for their maintenance introduced. Sites are to be officially designated for camping. Camp sites will be rented without tents and campers would be expected to continue the existing practice of packing their own tents and equipment. The NEMMA Office will however purchase two (2) tents and camping equipment for the use of its own staff.

So as to reduce environmental and health risks associated with human waste, the NEMMA Office will initially procure portable toilets and make them available to campers as part of the camping fee, or rent them as a separate charge. The impact on marine areas from tour boats, swimmers and snorkelers will be addressed by:

- The use of permanent moorings for tour boats at anchor
- The design and construction of two appropriately sized floating jetties, one on each of the south and north side passenger landing areas of Great Bird Island
- Snorkel trails installed to confine snorkeling to designated areas

Infrastructure needs for other areas of the reserve are to be defined in an Infrastructure and Equipment Plan to be prepared by the NEMMA Manager following consultations with the Fisheries Division and other NEMMA Board Members. Much will depend on the funds available to capitalize initial management operations.

13.3 Training

Training must be carried out commensurate with the recruitment and hence availability of staff to be trained. Once a decision is made on the type and number of positions to be filled, a strategy for training should be developed. It should identify options for training and certification of staff and where necessary volunteers. Certification is not only a testimony to skills attained but is valuable to the self esteem and moral of staff particularly when obtained from a reputable institution. National and site-level training needs identified by Parsram (2007) are given below:

- Ecosystem specific monitoring and assessments
- Species identification
- Ecosystems based management tools e.g. GIS
- Enforcement
- Organizational management and leadership
- Project development and management
- Site operations and management
- Protected area planning methods and management plan development

- Education awareness and outreach.

Other training needs identified during the consultations for this management plan are given below, along with possible source of training expertise:

- Interpretation and tour guiding: National Parks Authority/Tour Operators
- First aid & life saving skills: Red Cross
- Life guard services: Ministry of Tourism scheme
- Customer relations: Hospitality Institute
- Security: Private firms
- IT and computer skills: Antigua & Barbuda Institute of Technology
- Field monitoring skills: NPA, EAG, Fisheries Division
- Boating skills: Antigua & Barbuda Search and Rescue
- Resource assessment: Fisheries Division
- Wildlife conservation: EAG
- Financial management: Private firms

Support for training is available from the OPAAL project. Several of the above training needs are prioritized for OPAAL support, as indicated in Section 7.

13.4 Financial Management

13.4.1 Self-sufficiency

Self-sufficiency is to be a major aim of financial management. Thus, medium term and annual budgeting exercises should seek to recover all operating expenses from user fees and other sources of income and to carry forward any annual or fiscal year surplus to achieve same in the succeeding year. This should initially reduce and eventually avoid dependence on government subsidies for recurrent expenses.

13.4.2 Income Sources

a) Fees

User fees are to be charged for various uses of the NEMMA (see Table 13.2). Actual amounts are suggested but will need to be agreed and adopted as regulations which would provide the legal authority to collect the fees and enforce penalties for contraventions. User fees for snorkeling and selected other uses should be waived for residents initially.

Table 13.2: Uses for which User Fees are to be charged

Uses	Unit of Charge	Amount	
		EC\$	US\$
Kayaking	Daily	5.00	2.00
	Weekly	25.00	10.00

Snorkeling	Daily	5.00	2.00
	Weekly	25.00	10.00
Interactive Experiences			
▪ Stingray	Daily	5.00	2.00
	Weekly	25.00	10.00
▪ Dolphin	Daily	5.00	2.00
	Weekly	25.00	10.00
Tour Operators	Annual License		
Tour Passengers	Per tour	5.00	2.00
Yachts		25.00	10.00
▪ Mooring	Nightly	50.00	20.00
▪ Passengers	Daily	5.00	2.00
Vendors	Annual License		
Sport Fishing	Daily		
Commercial Filming	Daily	1,000.00	400.00
Camping (overnight)?	Daily	50.00*	20.00
	Weekend	100.00	40.00
Jetties	Yearly		
Marina berths	Yearly per berth	5% of fees	
Kite Surfing	Daily		
Wind Surfing	Daily		
Tent rentals	Daily		
* fee for groups of 6 persons or less; each additional person \$10			

A fee for entrance is a possible source of revenue but its collection is not manageable given the multiple points of entry into the NEMMA.

b) Other Income

The NEMMA Management Partnership is to encourage its membership or partners currently involved in projects to continue the practice of securing external and internal funding to continue their work or to engage in new initiatives beneficial to the programs, objectives and vision of the NEMMA. The NEMMA Office will be expected to aggressively and with creativity, identify potential sources of funding for management activities and write proposals for grants. Government is expected to provide start-up funding for staff positions and office operations for the first two years of NEMMA and to assist with the financing of the permanent NEMMA Office and Visitor Center.

13.4.3 Budget

The cost for procuring vehicles, equipment and furnishings for the NEMMA Office have been provisionally estimated at EC\$481,000 (US\$178,100), as indicated in Table 13.3. Funding for some of these items is expected to be provided by the OPAAL project, while government would be expected to fund others. Discussions with some stakeholders suggest that the possibility of obtaining private sector support for funding selected items is quite good. Office accommodations will be temporary until a dedicated Office/Visitor Center facility is

constructed. Temporary space will be limited but basic equipment and furnishings necessary for effective functioning in the first year are listed. Other items considered necessary can be purchased from the equipment and supplies line item in Table 13.3.

The cost for the first 12 month's operation of the Office is estimated at EC\$382,200 (US\$141,500), as shown in Table 13.4. This assumes an initial staff compliment of the Manager, Education/Awareness Officer, Maintenance Officer and six (6) Wardens/Rangers. Revenue estimates have not been made and should be addressed in the Business Plan to be prepared with technical assistance. Prospects for recovering over 50% of the expenses from revenue generated from user fees are good. Visitor volumes have grown significantly since the 1990s, when annual visitation was estimated at 14,500 persons (IRF, 1996). EAG (2000) estimated annual person visits at 20,000 and Mings (2003) found that the number had doubled to 40,000 persons. A minimum target of 50,000 person visits for the first 12 months would generate revenue of EC\$250,000 using a user fee charge of EC\$5 per trip to the NEMMA. Additional revenues would need to be generated from other sources. The Business Plan would need to provide realistic forecasts of expenditure and revenue over the 4 year period of the Management Plan.

Table 13.3: Provisional Estimates for NEMMA Office Vehicles, Furnishings and Equipment

No.	Item	Qty	Unit Cost (EC\$)	Total	
				EC\$	US\$
1	27 ft boat with equipment [O]	1	135,000	135,000	
2	27 ft boat with equipment	1	81,000	81,000	
3	15 ft boat with equipment	2	37,800	75,600	
4	4 x 4 Jeep	1	74,000	74,000	
5	4 x 4 Pick-up (4 doors)	1	67,000	67,000	
6	Desk top computer [O]	2	4,000	8,000	
7	Lap top computer	2	4,000	8,000	
8	Colour printer	2	1,300	2,600	
9	Photo copier	1	10,000	10,000	
10	Desks	3	1,500	3,000	
11	Chairs	3	400	1,200	
12	Filing cabinet	2	1,800	3,600	
13	Equipment (snorkel & fins, binoculars, camera, projector, etc.)			12,000	
	Total			481,000	178,100

[O] – Prioritised for OPAAL funding

Table 13.4: Estimates of Operating Costs for NEMMA Office, First 12 Months

No.	Item	Monthly Cost (EC)	First 12 Months Cost	
			EC\$	US\$
1	Staff Salary	27,000	324,000	
2	Vehicle operation/maintenance	2,000	24,000	
3	Telephone/fax	1,000	12,000	
4	Internet access	350	4,200	
5	Office supplies	500	6,000	
6	Mesc.	1,000	12,000	
	Total	31,850	382,200	141,500

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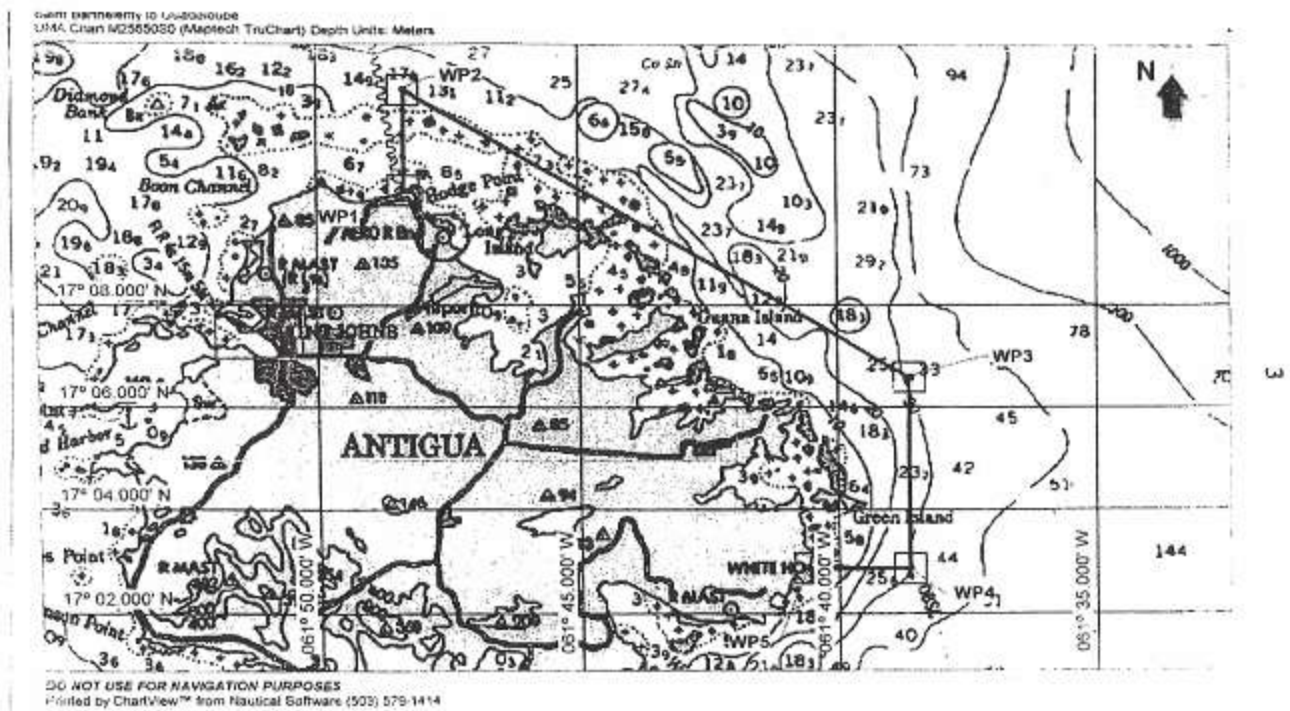
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APPENDICES



Appendix 1: Boundary of the NEMMA



The NEMMA is defined in relation to the Waters of Antigua and Barbuda bounded seaward by:

1. Latitude 17-10' 14"N and Longitude 061 – 48' 16"W
Latitude 17 – 12' 09.26"N and Longitude 061 – 48' 14.87"W to
Latitude 17 – 06' 34.72"N and Longitude 061 – 38' 36.59"W to
Latitude 17 – 06' 47.07"N and Longitude 061 – 38' 36.89"W to
Latitude 17 – 02' 48.23"N and Longitude 061 – 40' 26.74"W
2. The landward edges of mangroves and wetland systems or the line of permanent vegetation which ever applies
3. The following offshore islands:

Prickly Pear Island	Long Island	Guiana Island	Green Island
Great Bird Island	Maiden Island	Crump Island	Pelican Island
Galley Island Major	Rat Island	Nanny Island	York Island
Galley Island Minor	Little Bird Island	Laviscouns Island	Codrington Island
Jenny island	Hells Gate Island	Bird Island	Other unnamed islands/rocks
Exchange Island	Monocle Point Island	Round Island	
Rabbit Island	Read Head Island	Hawes Island	
Lobster Island	Lobster Island Extension	Little Island	

Appendix 2: Results of the Ecoengineering (2007) surveys on aquatic fauna and flora.

This appendix contains the following:

- Lists of aquatic fauna and abundance noted in the NEMMA,
- List of aquatic flora noted in the NEMMA,

The information in this appendix was collected by Ecoengineering (2007) during the OPAAL 'Baseline Studies' on the NEMMA. A series of rapid ecological assessments was conducted on representative coral reefs in February 2007 (for survey locations see Figure 2 of Ecoengineering, 2007). The Atlantic and Gulf Rapid Reef Assessment (AGRRA) protocol was adapted for the assessment due to time constraints. Nine roving ecological surveys were conducted, covering the widest area possible over the widest range of habitats and stress gradients. Along with the coral reefs, rapid assessments of the seagrass beds were also conducted.

The roving dive surveys involved the diver swimming freely throughout a dive site and recording the presence of all fish species, substrate changes and other invertebrate species that are encountered and that can be positively identified. The search for fishes and/or invertebrates begins as soon as the diver enters the water. The goal is to find as many species as possible. At the conclusion of each survey, each recorded fish species is assigned one of four abundance categories based on about how many were seen throughout the dive [single (1); few (2-10), many (11-100), and abundant (>100)]. The invertebrates are assigned either the abundance codes (Single, Few, Many, Abundant) or Present, depending on the species. Notes on each of the different fish and coral species are given by Ecoengineering (2007).

In addition, the Reef Check method was also used to gather data on substrate composition, target and indicator species of fish and invertebrates, coral condition (including bleaching and signs of disease) and obvious signs of human impact (garbage, anchor damage, abandoned fishing line, etc.). This monitoring provided a quantitative view of the extent of human impacts on reefs considered to be in the "best" condition.

A2.1 Fish Fauna

A total of 9 roving diver surveys were conducted for this study and a total of 51 species were noted. Tables A2.1 to A2.5 below list the fish fauna and the relative abundances within the NEMMA.

Table A2.1: Maiden Island Artificial Reef

Common Name	Scientific Name	Abundance			
		S	F	M	A
Beaugregory	<i>Stegastes leucostictus</i>				X
Barred Hamlet	<i>Hypoplectrus puella</i>	X			
Blue tang	<i>Acanthurus coeruleus</i>			X	
Bluehead Wrasse	<i>Thalassoma bifasciatum</i>			X	
Bluestriped grunt	<i>Haemulon sciurus</i>		X		
Bucktooth parrotfish	<i>Sparisoma radians</i>		X		

Common Name	Scientific Name	Abundance			
		S	F	M	A
Clown Wrasse	<i>Halichoeres maculipinna</i>		X		
Doctorfish	<i>Acanthurus chirurgus</i>		X		
Foureye Butterfly	<i>Shaetodon capistratus</i>		X		
French Grunt	<i>Haemulon flavolineatum</i>				X
Hamlet	<i>Hypoplectrus sp.</i>		X		
Lane Snapper	<i>Lutjanus synagris</i>			X	
Longspine Squirrelfish	<i>Longspine squirrelfish</i>		X		
Ocean Surgeon	<i>Acanthurus bahianus</i>			X	
Red band parrotfish	<i>Sparisoma aurofrenatum</i>		X		
Red Hind	<i>Epinephelus guttatus</i>	X			
Sergeant major	<i>Abudefduf saxatilis</i>		X		
Slippery Dick	<i>Halichoeres bivittatus</i>			X	
Southern Stingray	<i>Dasyatis americana</i>	X			
Spotted Eagle Ray	<i>Aetobatus narinari</i>	X			
Spotted Goatfish	<i>Pseudupeneus maculatus</i>			X	
Squirrelfish	<i>Holocentrus adscensionis</i>				X
Stoplight Parrotfish	<i>Sparisoma viride</i>			X	
Striped Parrotfish	<i>Scarus iseri</i>			X	
Three spot Damsel	<i>Stegastes planifrons</i>		X		
White Grunt	<i>Haemulon plumieri</i>			X	
Yellow Goatfish	<i>Mulloidichthys martinicus</i>			X	
Yellowhead Wrasse	<i>Halichoeres garnoti</i>		X		
Yellowfin Mojarra	<i>Gerres cinereus</i>		X		
Yellowtail Snapper	<i>Ocyurus chrysurus</i>		X		

Note: S- 1, F – 2-10, M-11-100, A - >100

Table A2.2: Great Bird Island

Common Name	Scientific Name	Abundance			
		S	F	M	A
Beaugregory	<i>Stegastes leucostictus</i>				X
Barred Hamlet	<i>Hypoplectrus puella</i>		X		
Blue tang	<i>Acanthurus coeruleus</i>			X	
Bluehead Wrasse	<i>Thalassoma bifasciatum</i>			X	
Bucktooth parrotfish	<i>Sparisoma radians</i>			X	
Clown Wrasse	<i>Halichoeres maculipinna</i>			X	
Doctorfish	<i>Acanthurus chirurgus</i>			X	
Foureye Butterfly	<i>Shaetodon capistratus</i>			X	
French Grunt	<i>Haemulon flavolineatum</i>				X
Green Moral Eel	<i>Gymnothorax funebris</i>	X			
Longspine Squirrelfish	<i>Longspine squirrelfish</i>		X		
Ocean Surgeon	<i>Acanthurus bahianus</i>			X	
Nasseau Grouper	<i>Epinephelus striatus</i>	X			
Red band parrotfish	<i>Sparisoma aurofrenatum</i>		X		
Sergeant major	<i>Abudefduf saxatilis</i>			X	

Common Name	Scientific Name	Abundance			
		S	F	M	A
Slippery Dick	<i>Halichoeres bivittatus</i>				X
Schoolmaster Snapper	<i>Lutjanus apodus</i>		X		
Smooth Trunkfish	<i>Lactophrys triqueter</i>	X			
Spotted Goatfish	<i>Pseudupeneus maculatus</i>			X	
Squirelfish	<i>Holocentrus adscensionis</i>			X	
Stoplight Parrotfish	<i>Sparisoma viride</i>			X	
Striped Parrotfish	<i>Scarus iseri</i>			X	
Three spot Damsel	<i>Stegastes planifrons</i>				X
White Grunt	<i>Haemulon plumieri</i>			X	
Yellowhead Wrasse	<i>Halichoeres garnoti</i>		X		
Yellowtail Snapper	<i>Ocyurus chrysurus</i>		X		

Note: S- 1, F – 2-10, M-11-100, A - >100

Table A2.3: Bird Island Reef

Common Name	Scientific Name	Abundance			
		S	F	M	A
Beaugregory	<i>Stegastes leucostictus</i>				X
Barjack	<i>Caranx rubber</i>		X		
Bermuda Chub	<i>Kyphosus sectatrix</i>		X		
Blue tang	<i>Acanthurus coeruleus</i>				X
Bluehead Wrasse	<i>Thalassoma bifasciatum</i>				X
Bucktooth parrotfish	<i>Sparisoma radians</i>		X		
Clown Wrasse	<i>Halichoeres maculipinna</i>				X
Doctorfish	<i>Acanthurus chirurgus</i>		X		
Foureye Butterfly	<i>Shaetodon capistratus</i>		X		
French Grunt	<i>Haemulon flavolineatum</i>				X
Longspine Squirrelfish	<i>Longspine squirrelfish</i>		X		
Ocean Surgeon	<i>Acanthurus bahianus</i>				X
Nasseau Grouper	<i>Epinephelus striatus</i>		X		
Red band parrotfish	<i>Sparisoma aurofrenatum</i>			X	
Saucereye Porgy	<i>Calamus calamus</i>		X		
Sergeant major	<i>Abudefduf saxatilis</i>		X		
Slippery Dick	<i>Halichoeres bivittatus</i>				X
Schoolmaster Snapper	<i>Lutjanus apodus</i>		X		
Spotted Goatfish	<i>Pseudupeneus maculatus</i>		X		
Squirelfish	<i>Holocentrus adscensionis</i>			X	
Stoplight Parrotfish	<i>Sparisoma viride</i>			X	
Striped Parrotfish	<i>Scarus iseri</i>			X	
Three spot Damsel	<i>Stegastes planifrons</i>			X	
White Grunt	<i>Haemulon plumieri</i>				X
Yellow Goatfish	<i>Mulloidichthys martinicus</i>		X		
Yellowhead Wrasse	<i>Halichoeres garnoti</i>			X	
Yellowfin Mojarra	<i>Gerres cinereus</i>		X		
Yellowtail Parrotfish	<i>Sparisoma rubripinne</i>		X		

Yellowtail Snapper	<i>Ocyurus chrysurus</i>			X	
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Note: S- 1, F – 2-10, M-11-100, A - >100

Table A2.4: Green Island

Common Name	Scientific Name	ABUNDANCE			
		S	F	M	A
Beaugregory	<i>Stegastes leucostictus</i>				X
Barred Hamlet	<i>Hypoplectrus puella</i>			X	
Bicolor damsel	<i>Stegastes partitus</i>		X		
Blue tang	<i>Acanthurus coeruleus</i>				X
Bluehead Wrasse	<i>Thalassoma bifasciatum</i>				X
Clown Wrasse	<i>Halichoeres maculipinna</i>		X		
Doctorfish	<i>Acanthurus chirurgus</i>			X	
Dusky Squirrelfish	<i>Sargocentron vexillarium</i>	X			
Fairy Basslet	<i>Gramma loreto</i>		X		
Foureye Butterfly	<i>Shaetodon capistratus</i>			X	
French Grunt	<i>Haemulon flavolineatum</i>			X	
Gray angelfish	<i>Pomacanthus arcuatus</i>	X			
Hamlet	<i>Hypoplectrus sp.</i>			X	
Harlequin bass	<i>Serranus tigrinus</i>		X		
Lane Snapper	<i>Lutjanus synagris</i>		X	X	
Longjaw squirrel	<i>Neoniphon marinus</i>		X		
Nasseau Grouper	<i>Epinephelus striatus</i>	X			
Ocean Surgeon	<i>Acanthurus bahianus</i>				X
Porcupinefish	<i>Diodon hystrix</i>	X			
Puddingwife Wrasse	<i>Halichoeres radiatus</i>		X		
Red band parrotfish	<i>Sparisoma aurofrenatum</i>			X	
Red Hind	<i>Epinephelus guttatus</i>	X			
Rosy Blenny	<i>Malacoctenus macropus</i>		X		
Sharpnose Puffer	<i>Canthigaster rostrata</i>			X	
Slippery Dick	<i>Halichoeres bivittatus</i>			X	
Spotted Goatfish	<i>Pseudupeneus maculatus</i>	X			
Squirrelfish	<i>Holocentrus adscensionis</i>			X	
Stoplight Parrotfish	<i>Sparisoma viride</i>			X	
Striped Parrotfish	<i>Scarus iseri</i>				X
Three spot Damsel	<i>Stegastes planifrons</i>				X
Trumpetfish	<i>Aulostomus maculatus</i>		X		
Tobaccofish	<i>Serranus tabacarius</i>		X		
Tomtate	<i>Haemulon aurlineatum</i>			X	
White Grunt	<i>Haemulon plumieri</i>		X		
Yellow Goatfish	<i>Mulloidichthys martinicus</i>		X		
Yellowhead Wrasse	<i>Halichoeres garnoti</i>			X	
Yellowfin Mojarra	<i>Gerres cinereus</i>		X		
Yellow tail Damsel	<i>Microspathodon chrysurus</i>		X		
Yellowtail Parrotfish	<i>Sparisoma rubripinne</i>		X		

Yellowtail Snapper	<i>Ocyurus chrysurus</i>			X	
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Note: S- 1, F – 2-10, M-11-100, A - >100

Table A2.5: Prickly Pear

Common Name	Scientific Name	ABUNDANCE			
		S	F	M	A
Beaugregory	<i>Stegastes leucostictus</i>				X
Barred Hamlet	<i>Hypoplectrus puella</i>			X	
Bicolor damsel	<i>Stegastes partitus</i>			X	
Bermuda Chub	<i>Kyphosus sectatrix</i>		X		
Blue tang	<i>Acanthurus coeruleus</i>		X		
Bluehead Wrasse	<i>Thalassoma bifasciatum</i>				X
Brown chromis	<i>Chromis multilineata</i>				X
Creole Wrasse	<i>Clepticus parrai</i>				X
Foureye Butterfly	<i>Shaetodon capistratus</i>			X	
French Grunt	<i>Haemulon flavolineatum</i>		X		
Great Barracuda	<i>Sphyræna barracuda</i>				
Hamlet	<i>Hypoplectrus sp.</i>			X	
Harlequin bass	<i>Serranus tigrinus</i>			X	
Nasseau Grouper	<i>Epinephelus striatus</i>	X			
Ocean Surgeon	<i>Acanthurus bahianus</i>			X	
Queen Parrotfish	<i>Scarus vetula</i>			X	
Red band parrotfish	<i>Sparisoma aurofrenatum</i>			X	
Sand Diver	<i>Synodus intermedius</i>	X			
Schoolmaster Snapper	<i>Lutjanus apodus</i>	X			
Sergeant major	<i>Abudefduf saxatilis</i>			X	
Sharpnose Puffer	<i>Canthigaster rostrata</i>		X		
Slender Filefish	<i>Monacanthus tuckeri</i>			X	
Slippery Dick	<i>Halichoeres bivittatus</i>			X	
Spotted Goatfish	<i>Pseudupeneus maculatus</i>		X		
Squirrelfish	<i>Holocentrus adscensionis</i>			X	
Stoplight Parrotfish	<i>Sparisoma viride</i>				X
Striped Parrotfish	<i>Scarus iseri</i>				X
Three spot Damsel	<i>Stegastes planifrons</i>				X
Trumpetfish	<i>Aulostomus maculatus</i>		X		
White Grunt	<i>Haemulon plumieri</i>			X	
Yellow Goatfish	<i>Mulloidichthys martinicus</i>			X	
Yellowhead Wrasse	<i>Halichoeres garnoti</i>			X	
Yellow tail Damsel	<i>Microspathodon chrysurus</i>			X	
Yellowtail Snapper	<i>Ocyurus chrysurus</i>			X	

Note: S- 1, F – 2-10, M-11-100, A - >100

A2.2 Corals

A total of 7 roving diver surveys were conducted for this study and a total of 22 species were noted as listed below:

Staghorn Coral	<i>Acropora cervicornis</i>
Elkhorn Coral	<i>Acropora palmata</i>
Fused Staghorn Coral	<i>Acropora prolifera</i>
Finger Coral	<i>Porites porites</i>
Thin Finger Coral	<i>Porites divaricata</i>
Branched Finger coral	<i>Porites furcata</i>
Yellow Pencil coral	<i>Madracis mirabilis</i>
Lamarck's Sheet Coral	<i>Agaricia lamarcki</i>
Star coral	<i>Madracis pharensis</i>
Ten-ray Star coral	<i>Madracis decactis</i>
Boulder Star Coral	<i>Montastrea annularis</i>
Boulder Brain coral	<i>Colpophyllia natans</i>
Starlet Coral	<i>Siderastrea siderea</i>
Lesser Starlet Coral	<i>Siderastrea radians</i>
Grooved Brain Coral	<i>Diploria labyrinthiformis</i>
Symmetrical Brain Coral	<i>Diploria strigosa</i>
Rose Coral	<i>Manicina areolata</i>
Golfball Coral	<i>Favia fragum</i>
Blade Fire Coral	<i>Millepora complanata</i>
Branching Fire Coral	<i>Millepora alcicornis</i>
Bipinnate Sea Plume	<i>Pseudopterogorgia biplinnata</i>
Common Sea Fan	<i>Gorgonia ventalina</i>

A2.3 Other Fauna

Porifera

Branching tube sponge	<i>Pseudoceratina crassa</i>
Yellow tube sponge	<i>Aplysina fistularis</i>
Brown tube sponge	<i>Agelas conifera</i>
Brown clustered tube sponge	<i>Agelas wiedenmyeri</i>
Pink Vase Sponge	<i>Niphates digitalis</i>
Loggerhead sponge	<i>Spheciospongia verparium</i>
Green finger sponge	<i>Iotrochota birotvlata</i>
Azure vase sponge	<i>Callyspongia plicifera</i>

Tube worms

Christmas tree worm	<i>Spirobanchus giganteus</i>
Variegated feather duster	<i>Bispira variegata</i>

Crustaceans

Scarlet-striped cleaning shrimp	<i>Lysmata grabhami</i>
Caribbean Spiny lobster	<i>Panulirus argus</i>

Smooth goose-neck barnacle *Lepas anatifera*

Molluscs

Queen Conch *Strombus gigas*

Echinoderms

Cushion Sea Star	<i>Oreaster reticulatus</i>
Long-spine	<i>Diadema antillarum</i>
Slate-pencil Urchin	<i>Eucidaris tribuloides</i>
Red Heart Urchin	<i>Meoma ventricosa</i>
West Indian Sea Egg	<i>Tripneustes ventricosus</i>

Cnidarians

Mangrove Upside-down Jelly	<i>Cassiopea xamachana</i>
Mat Zoanthid	<i>Zoanthus pulchellus</i>
Giant Anemone	<i>Condylactis gigantea</i>

A.2.4 Flora

Seagrasses

Turtle Grass	<i>Thalassia testudinum</i>
Manatee Grass	<i>Syringodium filiforme</i>
Shoal grass	<i>Halodule wrightii</i>

Algae

Sargassum algae	<i>Sargassum sp</i>
Encrusting Fan-Leaf Algae	<i>Lobophora variegata</i>
Leafy flat blade alga	<i>Stypopodium zonale</i>
Y branched alga	<i>Dictyota sp</i>
White Scroll Alga	<i>Padina jamaicensis</i>
Watercress Alga	<i>Halimeda sp</i>

Appendix 3: Summary of Uses by Selected Areas

	Area	Uses
a)	Prickley Pear Island	<ul style="list-style-type: none"> - residents & visitors - organized tours - Snorkeling, diving, picnics, nature appreciation
b)	Hodges Bay Shoreline	<ul style="list-style-type: none"> - multi-use resort/residential - Sunsail boating operations
c)	Jabberwock beach area	<ul style="list-style-type: none"> - popular beach - swimming, walking, picnics - kite surfing - Coast Guard, Defense Force training facility to the east
d)	The Bucket of Blood	<ul style="list-style-type: none"> - border of military establishment - residential area
e)	High Point Dock	<ul style="list-style-type: none"> - Active pier (in poor condition) - sand barge (Sammy's Concrete) - Liquid Propane Gas (Texaco) - Texaco storage tanks - Small earthen pier used by fishermen to the southeast - Beachcomber hotel
f)	Shell Beach Marina & restaurant	<ul style="list-style-type: none"> - small craft, pleasure & fishing boats - Travel lift & launch ramp - Yacht storage - Caribbean Star airline operations - other private businesses
g)	Barnacle Point	<ul style="list-style-type: none"> - Former historical Fort; Ft Byam - Stanford property: Reception & launch facility
h)	US Air Station Facilities	<ul style="list-style-type: none"> - Satellite & tracking facility
i)	Fitches Creek	<ul style="list-style-type: none"> - low density residential - large mangrove system - major watercourse discharge point for areas east of St. Johns
j)	Parham	<ul style="list-style-type: none"> - residential - Fisheries complex - storage - ferry terminal - marine transport
k)	Crabbs	<ul style="list-style-type: none"> - Theo tug & barge services - Crump's dredging & marine services - APUA power & desalt plants - APC power generation plant - Stanford facility: berthing, power generation & storage - Cement factory: dock for ships - Wadadli Beer - ABDF military facility: weapons, explosives storage, live fire drills & training

Appendix 3: Summary of Uses by Selected Areas (cont'd)....

	Area	Uses
l)	Parham to Devil's Bridge	- Sea moss cultivation - Stingray City - Paddles Sea Kayak Adventure Tours - Fishermen (sport & professional) - Seatons village - Willikies village - Resort & residential area at or near Long Bay
l)	Emerald Cove/Nonsuch Bay	- Emerald Cove development, includes small marina - Ayres Creek ecosystem - Discharge point for watershed discharges - La Perla development - Mill Reef Club - Brown Bay development - Harmony Hall
m)	Green Island	- yacht anchoring - snorkeling - hiking - picnics
n)	Great Bird Island Grouping	- organized tours - research - hiking - snorkeling - boat anchoring

Appendix 4: Job Descriptions of NEMMA Staff

a) NEMMA Manager

Responsibilities

- Liaise with and report to the NEMMA Management Partnership Board
- Attend Board meetings of the Partnership and function as Secretary to the Board
- Guide and supervise staff in the management of the NEMMA
- Prepare quarterly narrative Performance Reports on various management programs and Quarterly Financial Reports; the latter to be done in collaboration with the Treasurer of the Board
- Source and contract service providers in outsourcing key services for which the competence does not exist within the NEMMA Office; this activity to be executed in line with policy and procedures approved by the Board
- Prepare Annual Budgets for approval by the Board
- Prepare annual reports on the performance and accomplishments for presentation to the members of the Management Partnership at its Annual General Meeting (AGM)
- Prepare Grant Proposals to secure funding
- Implement and maintain a code of “Best Practices” or standards for the delivery of visitor services in the NEMMA

Qualifications

- A Bachelors Degree in an appropriate field of Natural Science or Natural Resource Management and at least two (2) years working experience in the field of project management and/or resource management
- Alternatively, five (5) years experience at a senior level in Park / Protected Areas Management

Remuneration

Employment package to be negotiated, based on experience and qualifications, but will include basic salary plus allowances

b) Administrative & Accounting Officer

Responsibilities

- Supervise office activities
- Maintenance of files in accordance with agreed internal filing system
- Manage income and expenditure records and generally perform office “bookkeeping” functions, using procedures recommended by auditors and approved by the NEMMA Board
- Assist the NEMMA Manager in the preparation of annual budgets

- Prepare monthly financial statements on the operations of the NEMMA Office

Qualifications

- Associate degree in accounting, with two (2) years work experience in the field or at least five (5) years working experience in responsible accounting job positions

Remuneration

Employment package to be negotiated, based on experience and qualifications

c) Research and Monitoring Officer

Responsibilities

- Coordinate research and monitoring activities within the NEMMA
- Execution of regular visitor satisfaction surveys
- Management of the NEMMA data base
- Prepare and print occasional Fact Sheets on relevant natural and socio-economic topics; some of which will highlight research findings
- Work with Fisheries Division and other stakeholders in the design and execution of monitoring activities

Qualifications

- A Bachelors Degree in an appropriate field of Natural Science or Natural Resource Management and at least two (2) years working experience in field research or data base management

Remuneration

Employment package to be negotiated, based on experience and qualifications

d) Product Development and Interpretation Officer

- Coordination of activities leading to improving and maintaining desirable quality in the experiences of visitors to the NEMMA
- Such activities to include:
 - trail development
 - signage
 - design and display of interpretive material
 - training of wardens in interpretation and guiding skills
- Monitoring the compliance of vendors, tour operators and other service providers in their adherence to standards or best practices

- Development of new attractions for visitor use consistent with approved recreation standards

Remuneration

Employment package to be negotiated, based on experience and qualifications

e) Education and Awareness Officer

- Coordination of education and awareness programs of the NEMMA
- Work with EAG and other stakeholder partners in building public awareness and appreciation of the heritage resources of the NEMMA
- Assist with the planning and execution of public awareness campaigns
- Provide support to the continued development of programs involving the participation of schools in the NEMMA

Remuneration

Employment package to be negotiated, based on experience and qualifications

f) Public Relations, Marketing & Sales Officer

Responsibilities

- Coordinate public relations, marketing and sales critical to achieving revenue objectives of financial management
- Develop public relations strategies
- Prepare marketing strategies and plans to achieve targeted levels of visitor use within the NEMMA
- Analyze results of visitor satisfaction surveys and develop demographic profiles of resident and non-resident visitors of the NEMMA for use in marketing
- Plan and execute market outreach initiatives targeting stay-over guests, cruise passengers and yacht passengers
- Develop and maintain effective working relationships with destination management companies, tour boat operators and various industry associations, such as the AHTA, Antigua and Barbuda Marine Trades Association (ABMTA) and the Antigua Cruise Tourism Association
- Work with the Ministry of Tourism in promoting the NEMMA as a major ecotourism and recreation component of the Antigua/Barbuda destination
- Work with the Product Development and Interpretation Officer in exploring and testing new product offerings for visitors to the NEMMA
- Work on promoting the NEMMA product brand
- Supervise the management of the NEMMA website

Qualifications

- A Bachelors Degree in marketing or public relations, with 2 years working experience in the field, or at least five (5) years work experience in marketing or public relations

Remuneration

Employment package to be negotiated, based on experience and qualifications

g) Maintenance Officer

Responsibilities

- Responsible for coordinating the maintenance and upkeep of NEMMA Office buildings, vehicles, boats, equipment, trails, camp sites and other movable or fixed assets
- Responsible for planning and executing maintenance schedules for the above
- Responsible for managing the outsourcing of maintenance functions for vehicles, boats, equipment and other assets that cannot be maintained by the NEMMA Office
- Develop and execute a system for recording repairs, servicing and upgrades of assets to ensure effective maintenance

Qualifications

- Training in one of the skilled trades and at least five (5) years work experience in building and/or equipment maintenance

Remuneration

Employment package to be negotiated, based on experience and qualifications

h) Wardens

Responsibilities

- Carry out programme of patrol and surveillance
- Enforcement of NEMMA rules and regulations and for the safety and welfare of visitors to the NEMMA
- Provide assistance and information to visitors of the NEMMA
- Help to interpret the heritage of the NEMMA
- Assist with public education and sensitization programs on the use and care of natural resources

Qualifications

- Basic training and familiarity with the use of outboard motor boats

- Certification in scuba diving or willingness to be trained and certified
- Training in first aid and life guarding and life saving techniques
- Basic familiarity with the sea and marine resources
- Competence in English to CXC basic levels

Remuneration

Salary to be commensurate with experience and qualifications