

TURNEFFE ATOLL COASTAL ZONE MANAGEMENT GUIDELINES 2011



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INTERPRETATION

The meanings of the following terms and abbreviations used in this document are as follows.

“**AGST&D**”: *Above Ground Septic Tank with Drain field (in Development Site tables)*

“**BC**”: *Belize City (in Development Site tables)*

“**BTB**”: *Belize Tourism Board*

“**CZMAC**”: *the Coastal Zone Management Advisory Council*

“**DOE**”: *the Department of the Environment, Ministry of Natural Resources and the Environment, GOB*

“**Entry**”: *private surveyors registered entry, lodged at the Lands & Survey Department, Belmopan*

“**First Aid**”: *a facility that is readily available for the provision of first aid to all who can prove they require it*

“**Fish camp**”: *a building or buildings that are permanently or temporarily used for, by full or part time commercial fishermen, as licensed by the Fisheries Department and sport fishing together with ancillary uses such as housing, trap making and storage, boat repair and docking, non commercial plantation, general storage*

“**GOB**”: *Government of Belize*

“**GPD**”: *Geology and Petroleum Department, Ministry of Natural Resources and the Environment, GOB*

“**Guest House**”: *housing facilities for visitors either as a part of the main residence or in a separate building, within the density requirements of the development sites (this is an abbreviated definition of the BTB and must meet their minimum requirements as such)*

“**Habitable Room**”: *a bedroom, living room, dining room or study. All other rooms, such as kitchen or bathroom, or storeroom are not defined as ‘habitable’*

“**IMS**”: *Institute of Marine Studies, University of Belize*

“**LSD**”: *Lands and Survey Department, Ministry of Natural Resources and the Environment*

“**LWMS**”: *Liquid Waste Management System (see section 4.2.8: Pollution control)*

“**Land**”: *all areas within the atoll that are either permanently or temporarily above the surface of the sea, whether through natural or man-made activity. The seabed, while not ‘physical’ land, is defined as National Land*

“**n/a**”: *‘not applicable’*

“**NHW**”: *Non Hazardous Waste (in Development Site tables)*

“**Residential**”: *a building or buildings that are used solely for permanent or temporary residential use by the owners or others on a non commercial basis, to the exclusion of all other uses and within the density requirements of the development sites*

“**Residential Tourism**”: *a building or buildings that are used, as one unit each, solely for permanent or temporary residential use on a commercial basis, to the exclusion of all other uses and within the density requirements of the development sites*

“**Resort**”: *a building or buildings which offers commercial and multi unit accommodation and general amenities to visitors together with ancillary uses such as staff accommodation, general storage and repair facilities, docking, within the density requirements of the development sites.*

“**TAAC**”: *Turneffe Atoll Advisory Committee*

“**TICP**”: *Turneffe Islands Committee Plan (1990-91)*

“**TACAC**”: *Turneffe Atoll Coastal Advisory Committee*

“**TASC**”: *Turneffe Atoll Sustainability Council*

“**TAT**”: *Turneffe Atoll Trust*

“**TICAC**”: *Turneffe Islands Coastal Advisory Committee, recently renamed TACAC*

“**Tourism Facility**”: *any facility that accepts visitors for payment, or in kind, included or not included in the current definitions; that is Guest House, Resort, or Residential Tourism*

“**WCP**”: *Waste Collection Point (see Development Site No 85)*

1. INTRODUCTION

Located 25 miles east of Belize City, Turneffe Atoll is the largest and most biologically diverse atoll in the Caribbean. Approximately 30 miles long and 10 miles wide, Turneffe is a self-contained coastal marine ecosystem made up of a complex pattern of coral reef, back-reef flats, cayes, channels and lagoons. The atoll supports a number of threatened and endangered species, including the American saltwater crocodile (*Crocodylus acutus*), Antillean manatee (*Trichechus manatus*), Hawksbill turtle (*Eretmochelys imbricata*), goliath grouper (*Epinephelus itajara*), and Nassau grouper (*Epinephelus stiiatus*).

For decades, Turneffe has been a major contributor to Belize's commercial harvest of lobster, conch and finfish. Additionally, the atoll is known worldwide as a sport fishing and scuba diving destination, and it is also an important center for marine research. Over the past decade, development pressures have increased enormously. Since 2000, the transfer of property from national ownership to private ownership has skyrocketed with large stands of mangroves cleared and critically important marine areas dredged and destroyed. Reversing this ominous trend will be difficult, if not impossible, without sustainable management of the atoll. Although there have been several attempts over that past two decades to develop a management structure for Turneffe, none currently exists. A brief history of the atoll is provided in ANNEX 1.

The Coastal Zone Management Act was passed in 1998 calling for the development of a Coastal Zone Management Plan by the Coastal Zone Management Institute and Authority (CZMAI). At that time, Turneffe was formally proposed as an area in need of planning. The first phase of the plan, the National Integrated Coastal Zone Management Strategy for Belize, was passed into law in 2001. That legislation, along with the Draft Cayes Development Policy (2001), guide the coastal planning programme under which the coastal area of Belize has been divided into nine (9) planning regions, including Turneffe Atoll. Each Planning Region contains unique social, economic, geographical, and administrative factors. The first goal of the coastal planning programme is the development of a sound and functional planning mechanism for each of the planning regions. Upon completion, the regional Development Guidelines are to comprise the first component of the Coastal Zone Management Plan for Belize.

In 2003, Turneffe Atoll stakeholders, implementing governmental agencies and relevant non-governmental agencies drafted the *Turneffe Islands Development Guidelines 2003*. However, the Guidelines were not acted on by the Coastal Zone Board of Directors nor forwarded to the House of Representatives. The history of these guidelines (first drafted in 1996) is provided in ANNEX 1. The Turneffe Atoll Coastal Advisory Committee (TACAC), formerly (TICAC), was revived in October, 2010 with a priority to review, revise and update the Turneffe Atoll Development Guidelines.

Seeking responsible and sustainable management of Turneffe Atoll, the Guidelines begin by stating five overarching objectives (Section 2). The Guidelines then present broad-based recommendations addressing thirteen sectoral areas (Section 3) to guide regulatory agencies and potential developers in decision-making and planning. The general implementation strategy for these Guidelines is presented in Section 4. Current TACAC membership and the primary implementation agencies are listed below (ANNEX 1) and a (now-outdated) section containing a summary of the 2003 land tenure may be found in ANNEX 2. Important provisional development site tables with specific recommendations and maps are presented in ANNEX 3.

2. OBJECTIVES

To sustain Turneffe Atoll's sensitive and valuable terrestrial and marine environments, the objectives of these Guidelines include:

1. Ensuring that Turneffe Atoll is managed in a manner which sustains the economic, social and ecological value of the atoll by preventing destructive development and/or over development.
2. Ensuring that Turneffe Atoll's valuable commercial fishery is managed sustainably through the implementation of modern fisheries management strategies.
3. Ensuring that Turneffe Atoll's tourism industry is managed sustainably by facilitating low-impact, nature-based tourism capitalizing on its unique natural assets.
4. Ensuring that Turneffe Atoll's unique and environmentally sensitive areas are protected and utilized to provide sustainable economic, social and environmental advantages.
5. Ensuring that a high percentage of Turneffe Atoll remains in its natural state through conservation measures.

3. SECTORAL POLICIES

Recommendations, Preferences, Positions

These policies are organized into thirteen sectors which address current and potential issues at Turneffe Atoll and provide recommendations from Turneffe Atoll stakeholders. They include: Fishing, Tourism, Land-Use, Dredging, Mangroves/Littoral Forest, Utilities, Pollution Control, Social Amenities/Recreation, Conservation, Invasive Species, Fisheries Enforcement & Security, Research & Education and Management Structure.

3.1 Fishing

Turneffe Atoll and its surrounding waters have provided a productive commercial and subsistence fishery for centuries beginning with the ancient Maya. For decades, Turneffe has been one of Belize's largest producers of lobster, conch, grouper and snapper while bonefish, permit, tarpon and snook are important species for sport fishing. As one of the more important sport fishing areas in Belize, Turneffe Atoll contributes significantly, and in a sustainable manner, to the economic advantages generated by sport fishing for Belize.

Turneffe Atoll's extensive mangroves, seagrasses and back-reef flats are critical breeding grounds for many fish species, and also provide important juvenile and adult habitats. These guidelines seek to ensure that the valuable fishing resources of Turneffe Atoll are not damaged and that critical habitats are vigorously protected. A 2010 analysis of Belize's sports fishing habitat by Green Reef recommended that the seagrass beds and back-reef flats at Turneffe Atoll be carefully protected.

Traditional fishermen, mostly from Belize City, utilize fishing camps which are either permanently or semi-permanently occupied. The number of camps decreased from 44 in 1996 to 34 in 2000 and to approximately 25 in 2011. Over the past 5 years, commercial fishing effort

along the reefs and on the back-reef flats has increased dramatically due to a marked increase in itinerant sailboat fishermen, mostly from Copper Bank and Sarteneja. Grouper and snapper populations have declined appreciably over the past two decades with the most precipitous decline over the past five years. Although good data is not available for other species, local fishermen indicate that their catches of other finfish and lobster have declined as well.

In the 1970's and early 1980's, gill and seine net fishing on, and around, Turneffe's backreef flats seriously diminished the atoll's sport fishery. Attempts to stop the netting lead to some violence but then a prolonged period without significant netting activity. Over the past 2 - 3 years netting has been re-initiated on, and adjacent to, the ocean-side bonefish flats, on the seagrass flats in the central lagoon and in creeks frequented by tarpon. These activities are once again having a significant impact on Turneffe's sports fishing sector with areas now notably devoid of resident schools of sport fish.

In 2009, Belize passed landmark legislation protecting bonefish, permit and tarpon based on verification that these three species sustainably generate nearly \$60 million dollars per year for Belize and provide more than 1800 jobs. Net fishing, if left unchecked, could easily negate Turneffe Atoll's considerable financial contribution to Belize's sport fishing sector.

The 2008 Fisheries Act, Chapter 10, Section 8 (1) indicates "In all areas outside the barrier reef and within the radius of two miles of the mouth of the Belize River, Haulover Creek and Sibun River, no person shall take fish by means of any beach seine, traps or as weir or stop net." Although this has not been literally interpreted or strictly enforced by the Fisheries Department to date, doing so is a viable option for addressing this problem.

Recommendations:

1. Turneffe Atoll's commercial fishery should be managed through the institution of modern ecologically-based fisheries management techniques that sustain its economic, social and ecological advantages of this fishery for future generations.
2. Turneffe Atoll's sport fishery should be managed to sustain its economic, social, and job-related advantages for Belize.
3. Fisheries enforcement for the atoll must be improved.
4. Development practices that damage commercial fishing and sport fishing habitats, particularly the back-reef flats and sea grass beds, must be prevented.
5. Net fishing should not be allowed at Turneffe in compliance with enforcement of The Fisheries Act, Chapter 10, Section 8 (1) and/or by other means.
6. Traditional fishermen should be provided with security of tenure (leases) for existing fishing camps.

3.2 Tourism

With a relatively healthy reef system, world-renowned back-reef flats and healthy seagrass beds, in addition to a plethora of marine creatures, sport fish, marine mammals and reptiles, Turneffe Atoll offers many attractions for nature-based tourism. The atoll's tourism industry is highly dependent upon healthy, intact marine and terrestrial environments. Turneffe Atoll's tourism industry should be directed towards low-impact, environmentally sensitive tourism while cautiously avoiding destructive practices which would compromise the source of the atoll's attraction as a tourism destination.

There are currently three operational resorts that cater to sport fishing, Scuba diving, snorkeling, and other ecotourism activities. Tours originating from Belize City, Ambergris Caye, Caye Caulker and other locations also utilize Turneffe Atoll for sports fishing, diving and snorkeling. Some cruise ship visitors also access the atoll.

Some traditional fishermen have expressed a desire to develop their fishing camps into small, guest houses offering the eco-cultural experience of the fishermen. These guidelines support this type of development, which is reflected in the Provisional Zoning Scheme (ANNEX 3).

Recommendations:

1. Promote low-impact, environmentally-sensitive, nature-based tourism with care to avoid practices that destroy Turneffe Atoll's sensitive and valuable habitats.
2. Avoid high-impact, environmentally-destructive tourism development.
3. All tourism facilities should meet BTB's minimum standards, including disaster preparedness and evacuation plans; and also meet the "*Tourism and Recreation Best Practices Guidelines for Coastal Areas in Belize*" produced by CZMAI.
4. BTB and/or DOE should not recommend or approve tourism facilities that do not conform to these development guidelines.
5. Tourism operators should assist Coast Guard and the Fisheries Department by providing monitoring and communications assistance related to security and fisheries enforcement.
6. Zoning schemes should give fishing camps the option to develop 'guest houses'; promoting opportunities for traditional users to benefit from tourism.

3.3 Land-Use

The Turneffe Atoll consists of approximately 28,350 acres which is made up of a mix of inundated mangrove swamp and low-lying land with an elevation up to a few feet above sea level. The cayes, some of them larger than 5000 acres, fringe an expansive lagoon system reaching a width of 5 miles and a length of 13 miles. Turneffe's cayes are characterized by approximately 77 vegetation types, reflecting the topography of the land. The higher land is generally covered by littoral forest, palmetto, broken palmetto thicket and some coconut; the inundated areas with high, medium and low mangrove.

The 'land', whether consisting of solid land, substantial mangrove stands or over-wash mangrove swamp, was, until recent years, predominantly national land. Over the past decade, an increasing number of properties have become privately owned.

The location of significant structures (lodging quarters, restaurants and bars) over the water is inherently adverse to the aesthetics of Turneffe Atoll. Moreover, it causes navigational hazards and sets an alarming precedent which would likely become very difficult to control. For these reasons, many coastal villages with local planning authority have disallowed this practice. Additionally, waste management is difficult to control with over-the-water development; and, although 'cleaner technologies' may initially be permitted, any leak or malfunction could cause immediate detrimental effects to the marine environment. Furthermore, Turneffe Atoll is exceptionally vulnerable to hurricanes making over-the-water construction infeasible.

Many coastal locations in Belize have instituted building height limits to ensure that the scenic value of the area is maintained. With increasing development on the atoll this is a matter that should be considered within management policies and zoning schemes.

In the early 1990's, there was a moratorium on the sale of National cayes. This policy is hereby supported and should be extended to include the cayes at Turneffe Atoll. Transferable leases and land speculation have resulted in more land being transferred into private ownership, and then foreign hands, resulting in little economic benefit for the people or the Government of Belize.

The revised inventory of cayes for Turneffe Atoll indicating current land tenure was completed in late 2002. This is summarized in ANNEX 2, however, it has changed dramatically since then. In 2002 there were 33 private properties, ranging in size from 500 square yards to 351 acres; 139 approved leases, ranging in size from 780 square yards to 85 acres; 33 lease applications that have not yet been approved, and 12 cancelled leases. The 1992 Inventory of Cayes had identified 103 leases. As this situation has changed so dramatically since 2002, an update of Turneffe's land tenure is essential.

Recommendations:

1. Reactivate the moratorium on the sale of small National Cayes and ask that it apply to Turneffe Atoll.
2. Establish a temporary moratorium on the sale of all National Land on Turneffe Atoll until an integrated management structure is in place.
3. Secure tenure (leases) for fishing camps that have been occupied on a long-term basis.
4. New leases for fishermen at Turneffe Atoll should be prioritized to traditional fishermen.
5. All lease conditions, transfers, and sub-divisions should conform to these guidelines.
6. Over the water closed-structures should be prohibited on Turneffe Atoll; particularly those which include bathroom facilities.
7. Building height limitations should be established for the atoll with enforcement by a yet-to-be-established management structure.
8. Turneffe's land tenure should be updated.
9. Utilize Marine Spatial Planning methodologies such as Marine Invest, as they become available, to better inform land use decisions and achieve the best possible sustainable ecological, economic and social advantages for Belize.

3.4 Dredging and Mineral Extraction

Turneffe atoll has sufficient high land for resort and/or residential development, as is detailed in the provisional development site tables in ANNEX 3, and conversion of swamp into "beaches" or "land" is not needed for development of the atoll. Protection of Turneffe's environment, particularly the reef, back-reef flats and seagrass beds, is essential to the survival of its two major economic sectors - commercial fishing and tourism. Dredging invariably destroys critical habitats for these enterprises - namely back-reef flats, sand flats and seagrass beds. Additionally, Turneffe Atoll's coral reefs are easily damaged by silt and runoff from dredging. The reef system at Turneffe has been under increased stress in recent years due to coral bleaching from climatic changes as well as damage from Hurricanes Mitch-1998, Keith-2000 and Richard-2010. As a result, it is particularly important to limit significant man-made stresses from activities such as dredging.

Recommendations:

1. Dredging conflicts with all of the objectives outlined in Section 2. Therefore, no dredging, sand mining, or land filling, with the exception of limited hand dredging around docks, should be allowed at Turneffe without 1) a comprehensive Environmental Impact Assessment to include a vetting process involving relevant stakeholders and 2) compliance with these Guidelines. .
2. In consideration of the objectives of these guidelines which include sustainability of commercial fishing sector and support of low-impact, nature-based tourism, development should be confined to areas naturally supportive of such development.
3. Any reclamation of lost property, (after hurricanes) should only be done in consultation with the relevant authorities. Dredging for this purpose should be kept to a minimum while guaranteeing that native habitats are not damaged.
4. Land without feasible access should not be developed and only minimal manual dredging for boat access should be allowed. The provisional development site tables (ANNEX 3) stipulate the provisions for piers.

3.5 Sensitive Habitats

Mangroves, seagrasses and back-reef flats and reefs are interdependent and particularly sensitive habitats which act as critical fishery breeding grounds, as well as habitat for juvenile and adult marine species. These habitats must be preserved if the ecological and economic values of Turneffe Atoll are to be sustained.

Mangroves are important for a variety of ecological and economic reasons including their role as fisheries nurseries and as habitat for birds, reptiles and marine invertebrate. Additionally, mangroves offer protection from hurricanes, provide flood control, and improve water purification through natural filtration services. Turneffe Atoll contains the largest area of mangroves found on Belize's cayes and the variety and extent of mangrove habitats found there is extraordinary.

Littoral forest refers to forested areas along the coast or cayes that generally occurs on the higher land. Littoral forest has distinctive plant assemblages such as red and white gumba limbo, sea grape, poisonwood, Matapalo fig, sapodilla, numerous shrubs and other flowering plants, which support a diverse assemblage of birds and insects. Caye littoral forest is likely the most threatened coastal habitat in the world and the eastern side of Turneffe Atoll is an especially important area for littoral forest.

Extensive, healthy seagrass beds throughout Turneffe are essential to the commercial fishery as well as sport fishing. Additionally, they are important in sustaining Turneffe Atoll's manatee population.

The firm-bottomed back-reef flats at Turneffe are recognized world-wide for their beauty and they sustain healthy populations of bonefish providing the backbone for Turneffe's sport fishing sector. Turneffe's back-reef flats also serve the commercial fishing sector in that they are important conch nurseries and conch harvesting locations. Furthermore, the back-reef flats provide juvenile habitat for numerous fish species and play an integral role in limiting storm damage by providing critical protection to the Eastern side of the atoll during hurricanes.

Turneffe's fringing reef, which surrounds the entire atoll, was once some of the healthiest coral reef in Belize but it now suffers from over exploitation and disrupted ecosystem dynamics. Along with extensive patch reefs throughout the atoll, the fringe reef provides the economic and ecological backbone of the atoll. In addition to numerous well-known advantages provided by coral reefs, Turneffe Atoll's reefs offer some of the Caribbean's best Scuba diving, snorkeling, and sport fishing. Turneffe Atoll's fringe reef is crucial for the protection of the atoll, and also helps to protect Belize City, from hurricanes.

Recommendations:

1. Due to the importance of mangroves as providers of ecological services for Turneffe Atoll and their value to its major industries (fishing and tourism), mangrove removal should be minimized and the Mangrove Protection Act of 1989 should be updated and strictly enforced.
2. Clearing of vegetation should be kept to a minimum and valuable littoral forest should be identified with GPS coordinates, clearly mapped and zoned for protection.
3. Some palmettos stands are selectively used for lobster trap construction and this use is sustainable in its present volume, although management may be required in the future.
4. Preservation of seagrass beds should be a priority in all management decisions at Turneffe Atoll.
5. Due to the economic and ecological importance of Turneffe's fringe reef, patch reef and back-reef flats, management of Turneffe Atoll should ensure that the integrity and health of these areas is carefully protected.
6. Modern planning methodologies, such as Marine Spatial Planning, should be used to further analyze, and presumably confirm, the economic, ecological and social value of preserving the unique and special areas at Turneffe Atoll.

3.6 Utilities

Because of remote location of the atoll, the availability of fresh water and electricity are major obstacles for development and also serve as potential sources of environmental degradation. These guidelines seek to ensure that proper consideration is given to the environmental consequences of providing these utilities, with site-specific recommendations included in the zoning scheme (ANNEX 3). The level of need and their resultant potential for impact fall into at least three categories: fishing camps, tourism development and residential development. In general, fishing camps are sparsely populated and require minimal utility infrastructure while tourism and residential developments require more advanced infrastructure.

Recommendations:

1. Tourism and residential developments should be required to provide detailed plans about how they will provide adequate fresh water which will not degrade natural fresh water resources used by wildlife.
2. Rainwater collection, recycling of gray water, and other water preservation methods, should be utilized as much as possible.
3. Maximal use of solar and wind power is recommended, yet it is recognized that some fuel based power will be necessary.
4. Power requirements should be minimized to the extent possible through the use of power-saving measures and other efficiencies.

5. As transportation and storage of fossil fuels present risks of serious contamination, adequate policies and procedures for these activities should be required and approved for all residential and tourism developments.
6. Fuel related contaminants must be disposed of responsibly and all tourism and residential development proposals should include responsible plans for these processes.
7. Transportation, distribution and disposal of fuel products should be monitored for all tourism and residential developments ensuring that appropriate standards are followed, possibly by a Turneffe management entity or the DOE.
8. Generating systems should be shared by neighboring developments whenever feasible.

3.7 Pollution control

The matter of pollution control is addressed in much the same manner as utilities with recommendations for tourism and residential development not being as strict as those required for fishing camps. This is based on occupation levels with tourism and residential developments generating far more waste.

Recommendations:

1. Procedures to minimize waste should be in place for all developments and recycling should be utilized as much as possible. On-site waste disposal should be accomplished in a manner consistent with the National Solid Waste Guidelines.
2. For tourism and residential developments, solid waste from toilets should be treated by means of an earth tub or similar type technology with the resulting compost used in landscaping. Open septic tanks should not be permitted for tourism or residential facilities and closed septic tank/drain-field systems should be permitted only with pre-approval from DOE.
3. Gray water should be recycled and reused as much as possible.
4. Food waste from tourism and residential properties should be composted and used on-site as fertilizer.
5. All hazardous waste, including batteries, tires, propellant cans and petroleum-based products, should be properly stored to avoid contamination and transported to the mainland for final disposal.
6. Metal containers should be used for incinerating burnable inorganic waste, although such incineration should be done in a manner that is not a nuisance to neighbors. Large-scale resorts (yet to be defined) should be required to utilize incinerators for these purposes.
7. For fishing camps, the volume of solid waste generated is small enough that incineration on site, given adequate precautions, should be acceptable. If a fishing camp develops a 'guest house', however, it should then conform to the recommendations above.
8. Open latrines should be used only in fish camps where the occupancy is minimal, i.e. 2-3 people. If a fishing camp develops a 'guest house', they should then conform to the recommendations above.
9. In an effort to reduce and prevent the environmental impacts associated with the disposal of waste products, the operators of cruise ships and other vessels should comply with the National Plan.

3.8 Social Amenities and Recreation

Given the remote location of the atoll and its relatively large and sparsely inhabited area, basic social amenities are largely unavailable. Furthermore, many inhabitants have very limited access to communication, even for emergencies.

Health care facilities are not available on the atoll. Depending upon the weather and other circumstances, access to emergency health care can be nearly impossible. Presently, no portion of the atoll is designated for general public recreation for day visitors or cruise ship visitors.

Recommendations:

1. Because there are no basic health care facilities on the atoll, all residents should be prepared to provide at least basic medical care and resorts are encouraged to provide assistance to the wider community when needed.
2. Provisions for emergency evacuation of inhabitants should be explored and formalized, possibly through the establishment of a Turneffe Management Plan.
3. The University of Belize, on Calabash Caye or other suitable facilities, should be used for meetings of the general community or specific groups/committees on the islands.
4. Public recreational areas, with infrastructure such as pier and bathroom facilities, should be established facilitate day-trip tourism at suitable sites on Turneffe. This could be established and overseen through the establishment of a Turneffe Atoll Marine Reserve with funding derived from user fees and conservation agency support.
5. Large vessels, including cruise ships, should only be allowed at sites or in harbors designated by the Belize Port Authority. Near the reef, vessels must moor at sites designated by the Fisheries Department where adequate mooring facilities have been installed. Tender vessels associated with the operations of large vessels will not be allowed to drop anchor where the anchor, chain or any part of the vessel could cause damage to the reef. In the event that the cruise ships or other vessels are to be anchored in the vicinity of the atolls or reef, permanent-mooring sites must be established for this purpose in consultation with the Fisheries Department and the Belize Port Authority.

3.9 Conservation

Turneffe is unique in that it is one of the few atolls in the Caribbean containing excellent reef development around its margins as well extensive back-reef flats and intact mangrove and seagrass habitat in its interior. It is also the largest of the four atolls in Mesoamerica. The reefs and hard-bottom communities support a diverse assemblage of corals, sponges, and fish. At least six critical fish spawning sites are known to exist around the atoll, including sites for the endangered Nassau grouper.

Turneffe contains some of the best remaining habitat for the American salt-water crocodile in the Caribbean, with perhaps the largest population in Belize of this endangered species. Sea turtles nest on the sandy beaches of the eastern cayes. Dolphins and the endangered Antillean manatee regularly frequent the interior network of mangrove cayes, creeks and lagoons. Several species believed to be endemic to Belize, including Belize's atoll gecko and the rare white-spotted toadfish, are found at Turneffe Atoll.

Turneffe Atoll has the unfortunate distinction of being the only atoll in the Belize Barrier Reef System without significant protection or management. Although recommendations and justifications for protection and management have been made since at least the mid 1990's, only two offshore spawning aggregation sites, at The Elbow and near Dog Flea Caye, have been declared Marine Protected Areas.

In the early 1990's, the Turneffe Islands Committee Plan identified a number of terrestrial areas to be reserved due to their high conservation value and these were confirmed by the Coastal Zone Management Authority and Institute in 1999. Prioritization of all marine conservation sites has yet to be officially accomplished, and this should be incorporated into the Turneffe Atoll Management Plan in the future.

A GAP analysis by Meerman, et al in 2005 identified Turneffe Atoll as one of the largest remaining marine gaps within the National Protected Areas System Plan and several NGO's have listed Turneffe Atoll as a top conservation priority. In 2008, Turneffe Atoll was highlighted as a regional gap and priority in the Mesoamerican Reef Eco-regional Assessment.

Recommendations:

1. An Integrated Marine Management Area, possibly a Marine Reserve, should be established to sustainably manage the ecological, economic and social assets of Turneffe Atoll.
2. The following CZMAI recommendations for conservation sites, which were endorsed in 2004, are again hereby endorsed by the TACAC and these sites should be reserved.
 - **Soldier Caye** - a nesting site for the roseate tern, least tern and white crowned pigeon;
 - **Grassy Caye** - a nesting site for turtles, the roseate and least tern as well as flats for bonefish and juvenile conch;
 - Portions of **Blackbird, Deadman's and Calabash cayes** - important nesting sites for the endangered American crocodile and turtles;
 - **Vincent's (or Northern) Lagoon**, the **Freshwater Creek** area, **Pelican Caye**, the **Crayfish Range** in Central Lagoon, **Shag Caye / Cross Caye, Cockroach Caye Range**, and **Douglas Caye**;
 - **Mauger Caye** which is the site of a historic lighthouse.
3. Turneffe's important conservation sites should be mapped and prioritized and this should include mapping of critical manatee, crocodile, turtle, dolphin and other wildlife areas.
4. Once a national level protection has been established and implemented, TACAC recommends that Turneffe Atoll become Belize's first Biosphere Reserve, emphasizing a multiple use (conservation, fishing/ tourism and education/research) zoning scheme.
5. National land lying outside of the identified provisional development sites should not be developed pending further evaluation including Spatial Marine Planning.
6. Policies should be initiated to further protect Turneffe's endangered and threatened species including the Antillean manatee, Hawksbill turtle, goliath grouper, Nassau grouper, and American crocodile. Known manatee areas should be marked with signage alerting boaters to their presence and appropriate no-wake zones should be established.

7. Dogs, cats and other domesticated animals should be contained so as not to disturb wildlife.
8. The economic, social and ecological benefits of conserving sensitive areas of the atoll should be more precisely defined through the use of methodologies such as Marine Invest.

3.10 Invasive Species

Lionfish, a species native to the Pacific Ocean, were first reported at Turneffe Atoll as early as 2008 and their numbers have increase steadily since then. With prolific appetites and no significant predators in the Caribbean, they pose a potentially ominous situation for the reefs and commercial fisheries at Turneffe, as well as elsewhere in Belize.

Recommendations:

1. Lionfish populations and impacts should to be closely monitored.
2. Intense fishing pressure for this species should be encouraged.
3. Plans for controlling the population of this invasive species should be coordinated with relevant agencies in Belize and throughout the Caribbean.
4. Funding for this effort is a high priority.

3.11 Fisheries Enforcement & Security

Due to limited resources and the remote location of Turneffe Atoll, it is widely acknowledged that fisheries enforcement is not adequate and that unlawful fishing activities such as illegal netting, poaching of protected aggregation sites, and harvesting of undersized conch and lobster are commonplace. Turneffe's commercial fishing sector, represented by BFCA, recognizes this as a major problem and they have asked that enforcement be enhanced.

Personal security is a concern for the occupants of Turneffe Atoll including fishermen, tourists and residential property owners. Security has clearly improved with the establishment of the Calabash Coast Guard Station; however, Coast Guard's ability to patrol and respond to all areas of the atoll is limited.

In May, 2011, the Fisheries Department, Belize Coast Guard and Turneffe Atoll Trust signed an accord initiating regular patrols at Turneffe Atoll. This represents a very positive step forward and the atoll's three major resorts have committed substantial resources for the effort. Additional enforcement efforts have been discussed which hopefully will come to fruition.

Recommendations:

1. Further cooperative public/private efforts should be explored to enhance enforcement and security at Turneffe Atoll.
2. Improving the ability for fishing camps, resorts and other Turneffe Atoll locations to communicate with the Belize Coast Guard for security purposes should be a priority.
3. Enhancing the ability of the Belize Coast Guard to easily travel to all areas of Turneffe Atoll, particularly the remote areas of the lagoon, should be enhanced.
4. Enlisting local fishermen and resorts to help with monitoring and surveillance should be promoted to enhance security.

3.12 Scientific Research and Education

As a relatively isolated area which encompasses all key aspects of a coastal marine eco-system, Turneffe Atoll is an ideal location for coastal marine research. For several decades Turneffe Atoll has served as the location for important research related to coral reefs, manatees, crocodiles, bonefish, permit and many other species with a number of monitoring and research projects currently underway.

The University of Belize's Institute of Marine Studies (IMS) on Calabash Caye is the preeminent marine research facility in Belize and IMS has expanded its educational and research focus at Turneffe Atoll in recent years. Additionally, the Oceanic Society, on the South end of Blackbird Caye, has operated primarily as a research, monitoring and educational facility doing important research on Turneffe's marine mammals and reptiles.

Recommendations:

1. The notable ability of Turneffe Atoll as a resource for coastal marine education and research should be embraced and promoted.
2. The biodiversity and interconnected coastal-marine habitats of the atoll should be carefully considered in management decisions to ensure the health of all aspects of the ecosystem with special consideration given to biological corridors.
3. The importance of ongoing monitoring and research to evaluate the effects of all influences on the atoll should be recognized and supported.
4. Additional studies related to bird distribution, nesting and flight paths as well as sustainable fisheries management and numerous other topics should be encouraged.

3.13 Management of Turneffe Atoll

For many reasons noted in these sectoral policies, including the lack of an official entity representing Turneffe Atoll and the need to facilitate these guidelines, an active management structure for Turneffe Atoll is desperately needed. The objectives of these Guidelines would be best served by the creation of a stakeholder-based management structure in the form of a Turneffe Atoll Marine Reserve.

Management responsibility for the Turneffe Atoll Marine Reserve would lie with the Fisheries Department. A Turneffe Atoll Marine Reserve would be developed through a cooperative effort between the Fisheries Department and key organizations including the Belize Fisherman's Cooperative Association, Turneffe Atoll Trust, the Belize Coast Guard, the University of Belize's Environmental Research Institute, CZMAI and possibly others.

In 2010, Turneffe Atoll was noted as a possible location for Belize's first Biosphere Reserve when UNESCO representatives visited the atoll. With the primary principles of a Biosphere Reserve being sustainable economic development, core conservation areas and scientific research, Turneffe seems ideally-suited to become Belize's first Biosphere Reserve.

Recommendations:

1. A Turneffe Atoll Marine Reserve should be established through the cooperative efforts of all Turneffe Atoll stakeholders including the Fisheries Department, the Belize Fisherman's Cooperative Association (BFCA), Turneffe Atoll Trust, the Belize Coast Guard, the University of Belize's Environmental Research Institute, CZMAI and others.
2. The Turneffe Atoll Marine Reserve should serve to responsibly and sustainably oversee the management of Turneffe Atoll and to assist with the implementation of these Management Guidelines.
3. Management responsibilities of the Turneffe Atoll Marine Reserve should include:
 - The development of a Management Plan with regular review and revision as needed
 - Implementation of these CZMAI Management Guidelines
 - Recommendations on policies, legislation, and regulations governing Turneffe Atoll
 - Oversight of fisheries enforcement programmes for Turneffe Atoll
 - Oversight of security measures and communications for Turneffe Atoll
 - Monitoring of development activities at Turneffe Atoll ensuring that proper legal procedures are followed
 - Oversight and advice on issues related to permits for development
 - Obtaining sustainable financing for the Marine Reserve
 - Recommendations on public relations and education about Turneffe Atoll
 - Recommendations for approval of research within Turneffe Atoll
 - Recommendation regarding development on Turneffe Atoll
 - Recommendations regarding zoning at Turneffe Atoll
 - Promoting low-impact, environmentally friendly tourism development
 - Enhancement of Turneffe Atoll's research and educational potential
 - Improvement of security for Turneffe Atoll residents
 - Fundraising to sustain these efforts
4. Turneffe Atoll should seek to be nominated as Belize's first Biosphere Reserve.

4. IMPLEMENTATION STRATEGY

The Turneffe Atoll Management Guidelines form part of the comprehensive Integrated Coastal Zone Management Plan being developed by the CZMAI. After approval of the Plan by the Board of Directors, it will be passed on to the House of Representatives for endorsement.

Following the government's policy of decentralization and inclusion of stakeholders in the decision making processes, it is envisioned that the regulatory and permitting agencies will recognize and affirm the stakeholder consensus expressed through these guidelines. The TACAC will work closely with the Coastal Zone Advisory Council regarding monitoring and implementation of the guidelines.

In addition to the overarching policies described in Section 3, the guidelines include a provisional zoning scheme, as presented in ANNEX 3. The identification of, and recommendations for the provisional zoning were based upon information received from

Government agencies, from the atoll's occupants and users, extensive field work, aerial photographs and satellite images obtained from 1995 to 2011. Zoning categories represent the maximum form of development allowable for any given parcel based on its intrinsic properties and its best use.

ANNEX 3 specifies the type of land use, lot size, building density, means of utility supply and other performance standards recommended for zoning categories. It is intended that development should take place in accordance with these categories although lower levels of development would be allowable on a parcel. All land will need to be assigned some level of zoning and precautionary principles will be applied to parcels with inadequate information available.

Planning is a continual process of recommendation, participation, implementation and review. These guidelines and zoning recommendations should be monitored on a continual basis in order to establish its strengths and weaknesses. It is acknowledged that some of the detailed information presented in the provisional site development recommendations will be in error. Thus all users of the plan are urged to provide updates and / or corrections to the CZMAC and TACAC.

Additional studies, including Marine Spatial Planning efforts, are needed, in liaison with the relevant authorities and the islands' stakeholders. Such studies should reveal information which may better determine how sustainable development of the atoll should proceed. Further research targeting the conservation of threatened and endangered species and critical marine habitats and species affected by the development on the cayes, must also be conducted and used to revise the provisional site development recommendations and overall development guidelines.

Through a management planning mechanism, TACAC will regularly update the provisional development sites with the realization that a) development of all listed sites could, in and of itself, cause an overdevelopment situation; and b) through the implementation of the Biosphere Reserve, as well as other considerations, sites may need to be added or removed. Working together to promote environmentally sound, rational and equitable development, these guidelines will hopefully set a good example of representative, cooperative and adaptive management.

5. ACKNOWLEDGEMENTS

The TACAC Committee is acknowledged for its hard work in revising, updating and expanding these Guidelines.

The original Turneffe Island Development Guidelines with Development Site Tables were compiled in 1996 by John McGill, with assistance from the following:

Richards, Gilbert 1994 Frame Survey Report (Fisheries Department)
Zisman, S; Minty, C; Murray, M 1995 Turneffe Terrestrial Resource Reconnaissance: Report to CCC Ltd, Department of Geography, University of Edinburgh
Turneffe Island Committee (courtesy Earl Young, CZMU, Fisheries Dept., and Clinton Gardiner, DCLS, Lands & Surveys Dept.)
Ray Lightburn, Blackbird Caye Resort, Turneffe Islands
Jonathan Ridley, Marjo Vierros, and Kevin Coye; Coral Caye Conservation
Gayle Bradley Miller, Marine Research Centre, University College of Belize

Susan Wells, CZMP
Carmen Cawich, CZMP
Rory Solis, CZMP
Turneffe Island Lodge, Turneffe Islands
Westby, Hopeton, Fisherman
Young, Morrel, Fisherman
Amigos del Mar, San Pedro
Alison Saunders, Oceanic Society Expeditions, Turneffe Islands
Lands and Survey Department, Ministry of Natural Resources, GOB
The Planning Section, Housing and Planning Department, Ministry of Housing, Urban
Development & Co-operatives, GOB
The Inventory of the Cayes, CZMU, 1992
Department of Archaeology
Lighthawk

In 2003, a substantial revision of TIDG was completed by the Turneffe Islands Coastal Advisory Committee (TICAC) and the TACAC wishes to acknowledge the hard work and dedication of all participants. Special acknowledgment for those efforts goes to World Wildlife Fund's Mesoamerican Caribbean Reef Conservation Program for funding the land tenure consultancy through Grant PVG-14 to the CZMAI and for supporting Dr. M. McField's time in editing this document. Janet Gibson is also acknowledged for her longstanding efforts and vision for creating the CZMAI and the mechanisms for management planning in Belize.

ANNEX 1: BACKGROUND

I. History of the Turneffe Atoll:

Turneffe Atoll is the largest and most biologically diverse atoll in the Caribbean. It consists of approximately 28,350 acres, which is a mix of mangrove swamp and low lying cayes with elevations up to approximately six feet above sea level. Turneffe Atoll's cayes fringe two large lagoons reaching a maximal width of 5 miles and a length of 13 miles.

The islands, some larger than 5000 acres, are covered by at least 77 different vegetation types including littoral forest, palmetto, broken palmetto thicket and some coconut. In recent years, most untreated coconut palms have succumbed to Lethal Yellowing. The complex pattern of cayes, spits, channels, lagoons and reef are an excellent breeding ground and nursery for wildlife and fish.

The history of the atoll dates to Mayan times with ancient Mayan settlements identified on Calabash Caye and Grand Bogue Point. Legend has it that the notorious pirate Black Beard once inhabited Turneffe.

In the early 1900's many high coastal areas on the east coast were planted with coconuts; however, hurricanes, disease and market changes destroyed the economic viability of the coconut plantations, and there is no meaningful commercial cultivation these days. Parts of the lagoon system were used for commercial sponge cultivation in the early part of the 20th Century.

Turneffe Atoll has been a productive fishery since ancient Mayan times and today the atoll is dotted with commercial fishermen's camps. Most commercial fishermen at Turneffe are from Belize City, Sarteneja or Copper Bank. Traditional fishermen inhabit fishing camps on land leased from the Government of Belize and more recent fishermen access the atoll on live-aboard sail boats.

Turneffe has been an important tourism location in Belize for more than three decades and has become known worldwide for its Scuba diving and shallow water flats fishing. There are currently three operational resorts which cater primarily to sport fishing, diving, snorkeling and ecotourism clientele. Tourists from other locations including Belize City, Caye Caulker, San Pedro and the live-aboard dive boats also utilize Turneffe.

Prior to the past decade, the Turneffe Atoll was primarily National Land but over the past several years a large share of the atoll has been transferred to private interests. Land sales and the transfer of leases from fishermen to others has led to an increase in land speculation.

II. History of the Turneffe Islands Development Guidelines:

In the early 1990's the "Turneffe Islands Committee" was established to help protect the atoll's fragile environment and the rights of customary users, the commercial fishermen. The Turneffe Islands Committee intended to allot parts of the atoll for different uses; however, this process was never initiated and TIC ceased to exist in 1992.

In 1994, the need for effective management and protection of Turneffe was emphasized by the three ministries principally responsible for Belize's Coastal Zone: The Ministries of Agriculture and Fisheries, Environment and Tourism. In 1996, John Gill *et al* drafted the Turneffe Islands Development Guidelines (TIDG) with the aim of achieving sustainable development of the atoll. This evolved through an extensive study of the region and consultation with identified stakeholders.

The Coastal Zone Management Act was passed in 1998 calling for the development of a Coastal Zone Management Plan and Turneffe was formally proposed as an area in need of planning. The first phase of this plan, the National Integrated Coastal Zone Management Strategy for Belize, was passed into law in 2001 and the coastal area of Belize was divided into nine planning regions, including Turneffe. This plan called for the drafting of Development Guidelines for all the cayes in Belizean waters.

In 2001, several factors prompted the need for further planning and revision of the Gill TIDG. One was the establishment of the Government of Belize/University of Belize Institute of Marine Studies (IMS) (originally the Marine Research Centre) on Calabash Caye; another was a proposal that the Turneffe Island Development Guidelines act as a model for future planning in the coastal zone.

In August 2001, the Turneffe Islands Coastal Advisory Committee (TICAC) held an initial meeting and over the following two and one-half years the Turneffe Island Development Guidelines (TIDG) were re-drafted and adopted by TICAC. Like the 1996 Guidelines, however, these were never formally adopted by GOB and the TICAC subsequently remained dormant for several years.

In October, 2010 with the revitalization of CZMAI, the TICAC was reformed and renamed the Turneffe Atoll Coastal Advisory Committee (TACAC) in line with the proper name of the atoll. Again, the primary mission of TACAC has been the revision and updating of these Guidelines.

Several notable changes have taken place at Turneffe since the 2004 Guidelines. These include large shifts in land ownership from national land to the private sector initiating an increase in land speculation. Inadequate monitoring of development has resulted in several unfortunate examples of environmental damage. Commercial fishing pressure has steadily increased with resultant concerns about the health of Turneffe's fishery. The Belize Coast Guard has established a permanent base on Calabash Caye affording opportunities for improved fisheries enforcement and security. The University of Belize's Environmental Research Institute has been revitalized and expanded.

In 2005, a GAP analysis by Meerman, *et al* identified Turneffe as one of the largest remaining marine gaps within the National Protected Areas System Plan and in 2008 Turneffe Atoll was highlighted as a regional gap and priority in the Mesoamerican Reef Eco-regional Assessment. In 2008, two small offshore spawning aggregation sites near Turneffe, Dog Flea Caye and The Elbow, were established as Marine Protected Areas.

The need for an entity to manage the atoll's substantial resources for the good of Belize and to oversee the sustainable development of the atoll and has been recognized since the early 1990's. However, all attempts to date have failed. In 2011, Turneffe remains the only substantial offshore area in Belize without a management structure or significant protection. There is renewed interest among stakeholders for improving fisheries enforcement, security and management of the atoll's assets by updating these Guidelines and establishing Turneffe Atoll as a Marine Managed Area.

III. Current membership on the TACAC:

Craig Hayes	Turneffe Atoll Trust (Chairperson)
George Myvett	Fisheries Department (Vice-chairperson)
Chantal Clarke	Coastal Zone Management Authority and Institute (Secretary)
Lindsay Garbutt	Fisheries Advisory Board
Mustafa Toure	Consultant
Melanie McField	Healthy Reefs Initiative
Lt JG Gregory Soberanis	Belize National Coast Guard
Leandra Cho-Ricketts	University of Belize
Thomas Blanco	Belize Tourism and Industry Association
Ralna Lamb	APAMO
Birgit Wining	Oceanic Society
David Carl	Turneffe Island Resort
Nadine Nembhard	Belize Fishermen Cooperative Association

V. Primary Implementation Agencies:

The TACAC affirms its function as an Advisory Committee making recommendations to implementing agencies through the CZMAC. TACAC recognizes that governmental agencies charged with implementation sit on the TACAC and/or the CZMAC, and as such, it is the impression of the TACAC that recommendations from TACAC will be recognized as stakeholder mandates and carry a resultant high measure of credibility with implementing agencies.

The primary agencies involved in the formal implementation of development guidelines are identified as the following Government, quasi-governmental, voluntary and private organizations:

- sub-division regulation: the Physical Planning Section and the Land Utilization Authority (Lands Department);

- construction of coastal structures: the Physical Planning Section (Lands Department);
- hotel development: the Belize Tourist Board, Belize Hotels Association, Belize Tourism Industry Association;
- housing: the Housing and Planning Department;
- fiscal incentives: Belize Trade and Investment Development Service;
- tour operations: the Belize Tourist Board, Belize Tour Operators' Association, Belize Tour Guide Association, the Coastal Zone Management Institute and Authority;
- fishing: the Fisheries Department;
- wildlife conservation: the Conservation Division of the Forest Department;
- aquaculture or mariculture: the Fisheries Department;
- gravel extraction and dredging: the Geology and Petroleum Department;
- environmental screening: the Department of the Environment;
- marine reserves: the Fisheries Department, NGOs (under license from the department);
- national parks, monuments, wildlife sanctuaries and nature reserves: the Forest Department, Protected Areas Conservation Trust, NGOs (under license from the department);
- forest reserves: the Forest Department, NGOs (under license from the department);
- mangrove protection: the Forest Department;
- disaster preparedness and planning: the National Emergency Management Organization;
- shipping and cruise ships: the Belize Port Authority, the Belize Tourist Board;
- security: The Belize Coast Guard, the Belize Police Department

ANNEX 2: LAND TENURE ON TURNEFFE

Turneffe Islands Land Tenure Report

The land tenure analysis of 2002 is outdated to the point of being irrelevant due to the transfer of a large portion of Turneffe land from GOB to the private sector since 2002. A new analysis is needed, however, this is financially beyond the scope of TACAC at this time.

ANNEX 3: PROVISIONAL DEVELOPMENT SITE TABLES

SITE TABLES NEED REVISION

The provisional development site tables (2002) recommend the following categories as primary land use: fish camp (47.5 %), conservation/research/education (25.5%), fish camp/residential (12%), resort (4%), residential (4%), research and educational facility (2%), waste collection and its access (2%), recreation (2%), and fish camp/residential/resort (1%).

The secondary land use categories recommended are guest house (48.5%), residential (4%), fish camp (3%), residential/guest house (3%), first aid (2%), conservation (2%), residential tourism (2%), residential tourism combined with fish camp, resort, or guest house (5%), first aid/research and education/marina (1%), and guest house/resort/docking facility (1%). Twenty-eight point five percent (28.5 %) of the provisional development sites have no option of secondary development recommended.

Please note that the above percentages are of the total number of provisional sites and not percentage of land on Turneffe.

The recommendations of the 2003 TICAC Committee were not adopted by the GOB or pertinent permitting agencies. Examples below emphasize the consequences of this and the need to move toward binding development parameters as quickly as possible. These three examples represent destructive development resulting in significant degradation of the ecological and economic value of Turneffe Atoll.

2003 Guidelines Recommendation - Site 45 (Ropewalk Caye): “In 2000 this appeared to have been abandoned. The confinement by the reef calls for development that will have a low impact and will not require ready sea access. The caye has been identified as important nesting sites for the American Crocodile, it is also surrounded by valuable bonefish habitats.”

2011 Status: All vegetation on this area has been cleared and the low-lying land has been filled with dredged sand from one of the most productive and scenic bonefish and permit flats in the world. The back-reef flat has been dredged from the reef to the shoreline not only destroying the back-reef flat but also seriously jeopardizing the reef. The Department of Geology has provided information that this project was not of sufficient size to require an EIA.



Large back-reef flat dredged



Dredging extends to near reef

2003 Guidelines Recommendation – Site 4 (Cockroach Caye): “The natural vegetation should be left undisturbed. These cayes are located on the reef with minimal access. They are located in valuable bonefish habitat. In 1995, one of two central cayes (Babyroach) was cleared. This camp was destroyed by Hurricane Mitch and all cleared land was washed away. These cayes are on the reef and, as such, are highly sensitive and offer no potential for development. The northernmost caye has been severely reduced through hurricane and reclamation would be hazardous. Due to their location right on the reef it is recommended that they remain undeveloped.”

2011 Status: Site 4 has been cleared of native vegetation and filled with sand so that (per The Department of Geology), “the owner’s children can have sand to walk on”. Prime bonefish habitat was dredged for the fill and the adjacent reef has been used to build a coral house on the caye and to construct a seawall to hold the dredged sand.



Sea wall made from coral reef



House made from coral reef