

**PALMAS DEL MAR HOMEOWNERS ASSOCIATION
SEA TURTLE HABITAT CONSERVATION PLAN (HCP)
PALMAS DEL MAR
HUMACAO, PUERTO RICO**

Includes:

Palmas Doradas
Plaza del Mar
Beach Village Regime II
Beach Village Regime IV
Beach Village Regime V
Crescent Cove Condominium
Crescent Beach Condominium
Beach Bohio
Solarea
Beach Club
Marbella Club

This document updates and replaces
HCP dated September 28, 1999 and
approved by USFWS on January 17, 2003

**Antonio Maldonado
Executive Director
Palmas del Mar Homeowners Association**

August 9, 2014

TABLE OF CONTENTS

	Page
I. INTRODUCTION	5
II. COASTAL DEVELOPMENT DESCRIPTION	6
III. STATUS OF THE SPECIES	6
A. Leatherback Sea Turtle.....	6
1. General Information.....	6
2. Nesting Activity Survey.....	7-8
B. Hawksbill Sea Turtle.....	9
1. General Description.....	9
2. Nesting Activity Survey.....	9
IV. PROJECT IMPACT AND CONSERVATION MEASURES	10
A. Beach Cleaning.....	10
1. Description.....	10
2. Impact on Sea Turtles.....	11
3. Conservation and Mitigation Measures.....	11-12
4. New Proposed Conservation and Mitigation Measures.....	13
B. Beach Vehicular Driving.....	13
1. Description.....	13
2. Impact on Sea Turtles.....	14
3. Conservation and Mitigation Measures.....	14

C.	Recreational Structures on the Beach.....	15
1.	Description.....	15
2.	Impact on Sea Turtles.....	15
3.	Conservation and Mitigation Measures.....	15-16
D.	Recreational Beach Equipment.....	16
1.	Description.....	16
2.	Impact on Sea Turtles.....	16
3.	Conservation and Mitigation Measures.....	16
E.	Beachfront Lighting	17
1.	Description.....	17
2.	Impact on Sea Turtles.....	17
3.	Conservation and Mitigation Measures.....	17-19
F.	Landscaping.....	20
1.	Description.....	20
2.	Impact on Sea Turtles.....	20-21
3.	Conservation and Mitigation Measures.....	21
G.	Education: A strategy for Sea Turtle Conservation.....	21-22
V.	NEW AREAS BEING ADDED TO THE PROJECT PROPERTY.....	22
1.	Marbella Club.....	22
2.	The Beach Club.....	23
3.	Solarea.....	23
4.	Palmas Doradas.....	24
5.	Plaza del Mar.....	24

VI.	FUNDING.....	25
VII.	UNFORSEEN EVENTS	25
VIII.	LITERATURE CITED.....	26-27
IX.	LIST OF ATTACHMENTS.....	28-29

I. INTRODUCTION

This Habitat Conservation Plan has been prepared as an amendment to the existing Palmas del Mar Habitat Conservation Plan (HCP). The new Incidental Take Permit (the Permit) being requested is based upon the Permittee expected compliance with the provisions and commitments established in this HCP and the Permit's stated terms and conditions. Five new areas are being added to the Project property which until now have included Crescent Beach, Crescent Cove, the Beach Bohio, Beach Village Regimes II, IV and V and Coqui Park. The new areas are Marbella Club, Solarea, the Beach Club, Palmas Doradas and Plaza del Mar. These new areas are contiguous to the areas previously included in the Permit.

For more than ten years now the community of Palmas del Mar has been protecting, monitoring and reporting sea turtle nesting activity along the shoreline of Palmas del Mar, Humacao, Puerto Rico, in accordance with the Sea Turtle Habitat Conservation Plan (HCP) and the Incidental Take Permit (TE 033100-0) approved by U.S. Fish and Wildlife Service (USFWS) on January 17, 2003 (see attachment 1). Inspections and nest surveys are conducted on a daily basis by DNR certified and trained biologists. Monthly reports are prepared detailing sea turtle and nesting activity and documenting any deviations or findings from the HCP or the Take Permit (see actual monthly report at attachment 2). Annual reports are being submitted by the Palmas del Mar Homeowners Association or PHA (the Permittee) to DNR and USFWS as required by the Permit (See 2013 Report in Attachment 3). Nest relocation activity to protect nests from wave erosion is being conducted by qualified personnel in accordance with the Puerto Rico Department of Natural and Environmental Resources (PRDNER) approved protocol and permit (see attachments 4).

Palmas del Mar is a 2,900 acre master planned community resort development located in the Caribbean Sea coast, in the municipality of Humacao, Puerto Rico (see map at attachment 5). The development currently includes approximately 3,400 residential units in various real estate projects and approximately 900 acres of undeveloped land. In addition to its residential units the Palmas del Mar development contains several amenities including two golf courses, a tennis center, beach club, hotels & casino restaurants, an equestrian center, private school grades kinder through twelve, real estate offices, bank medical offices and several other business establishments. In addition to a daily work-force of approximately 3,500 persons over 350,000 visitors come to Palmas del Mar on an annual basis.

The Palmas del Mar Homeowners Association or PHA (the Permittee), created in September 1972, is the organization that services, groups and represents all residents and property owners within the Palmas del Mar development in accordance with the Deed of Restrictive Covenants that governs such a community resort. As such, it is PHA who has developed and administers the Palmas del Mar Habitat Conservation Plan (HCP) and insures compliance with the USFWS Incidental Take Permit.

The Permittee oversees the services and operation of coastal residential areas and projects including Marbella Club, the Beach Club, Solarea, Crescent Beach, Crescent Cove, Palmas

Doradas, the Beach Bohio, Beach Village Regimes II, IV & V, Coquí Park and Plaza del Mar (the proposed Project property). Within this area, status surveys and biological analysis indicate that both endangered hawksbill sea turtle, *Eretmochelys imbricata*, and the leatherback sea turtle, *Dermochelys coricea*, utilize the beach on the Project property as nesting habitat.

Eretmochelys imbricata and *Dermochelys coricea* nesting activity occurring on the Project comprise the “covered species”. Nesting activity of these species have been monitored and reported to USFWS and to PRDNR for the past eleven years (see attachment 3, 2013 report).

II. COASTAL DEVELOPMENT DESCRIPTION

Palmas can be divided in two parts: developed beaches and “undeveloped beaches”. The **Developed Beaches** includes the Project property of Plaza del Mar, Coquí Park, Beach Villages Regimes II-IV-V, Beach Bohío, Palmas Doradas, Crescent Cove, Crescent Beach, Solarea at Punta Candelerero, the Beach Club and Marbella Club (see attachment 6). The “**Undeveloped Beaches**” include coastal area that extends from the Candelerero River north to the Buena Vista ward. “**Undeveloped beaches**” have no condominiums or buildings in the zone that can potentially affect nesting activity (see attachment 7). In this area, Palmas del Mar has a golf course separated from the beach by natural vegetation.

The now proposed Project property or area covered by this Habitat Conservation Plan (HCP) is the beachfront from Marbella Club Condominium south to Plaza del Mar near the Marina. This includes the following developments: Marbella Club, Beach Club, Solarea, Crescent Beach Condominium, Crescent Cove Condominium, Beach Bohío, Palmas Doradas, Beach Village Regime II, Beach Village Regime IV, Beach Village Regime V, Coqui Park and Plaza del Mar (see attachment 8). This HCP does not include the “undeveloped beaches” because these areas were covered by a formal Section 7 consultation between the US Army Corps of Engineers and the USFWS for the proposed expansion of Palmas del Mar in 1994 by the Palmas del Mar Properties, Inc.

The beaches along the Project property, as well as the adjacent beaches, provide an important nesting habitat for two endangered sea turtles species: *Dermochelys coreacea* (leatherback) and *Eretmochelys imbricata* (hawksbill). There are no registered *Chelonia mydas* (green sea turtle)) or *Caretta caretta* (loggerhead sea turtle) nesting in the area.

III. STATUS OF THE SPECIES

A. Leatherback Sea Turtle (*Dermochelys coreacea*)

1. *General Information*

The leatherback sea turtle was listed as endangered in 1970. The leatherback is the largest living turtle in the world and is so distinctive that it is placed in a separate family, *Dermochelyidae*. All the other sea turtles are in the family *Cheloniidae*. The leatherback can attain shell lengths of six

feet and weights of up to 1,400 pounds. Black with white spots, it lacks scales and is covered by a firm, rubbery skin with seven longitudinal ridges or keels (USFWS, 1991).

Nesting grounds are distributed worldwide, with the Pacific coast of Mexico supporting the world's largest known concentration of nesting leatherbacks (USFWS, 1992). In the wider Caribbean region, the species nest in French Guiana, Surinam, Guyana, Colombia, Venezuela, Panama and Costa Rica. The species nest in islands of the eastern Caribbean of the Greater and Lesser Antilles. In the U.S. Caribbean: Puerto Rico and the U.S. Virgin Island may support nesting of 150 to 200 adult females per year, representing the most significant nesting activity of this species within the United States (USFWS, 1992).

Currently in Puerto Rico, the leatherback sea turtle nesting activities are monitored by USFWS and PRDNER. The major nesting activities are in Fajardo-Luquillo and Dorado-Toa Baja areas followed by Maunabo, Culebra, Vieques, Humacao and the Mayaguez-Añasco zone (PRDNER 2009). Leatherback nests along the Humacao's beaches (Matos, 1986, 1987; Cintron, 1987). The leatherback nesting beaches are Punta Santiago, Humacao Nature Reserve, Buena Vista and Palmas del Mar.

There are approximately 13 kilometers of beach used by the sea turtles for nesting in Humacao. Of this distance, 2.5 kilometers of beach are adjacent to Palmas del Mar. In Palmas del Mar, the leatherback nesting beaches are located between Candelero River and Buena Vista ward and from the Candelero River south to the Marina flushing channel, according to the data from surveys conducted by the Permittee between 1997 and 2013 (see map at attachment 9).

The leatherback preferred nesting beaches are free of rocks, coral and other hard abrasive material (Pritchard and Trebbau, 1984; NRC, 1990). Main nesting beaches for leatherbacks are characterized by their deep-water approaches, steep slopes and high-energy wave action (Pritchard and Trebbau, 1984; NRC, 1990). These characteristics of the leatherback nesting areas, are those shown on the beaches associated with Palmas del Mar.

2. *Nesting Activity Survey*

In Palmas del Mar, sea turtles nesting surveys are conducted in all the beaches along the coast in accordance with the USFWS Incidental Take Permit. The nesting survey starts at Plaza del Mar in the South and ends in Buena Vista ward north of the Candelero River. Surveys are conducted between 4:00 a.m. and 9:00 a.m. when crawls are fresh and easy to interpret. Surveyors have a valid PRDNER permit and have been trained and certified by PRDNER in nest surveys, markings and relocation procedures.

All nests left in situ are marked for avoidance by a series of stakes with a minimum 5-foot radius around the clutch and connected with orange colored material visible to the public (see photo at attachment 10 of actual nest area). In cases where it is difficult to approximate the location of the clutch and the radius of the disturbed area is greater than 5 feet, personnel stake an area that is slightly larger than the entire nest-disturbed area. An additional marker is placed at a nearby prominent point to ensure that the nest can be located in the future if the beach markings are lost.

Information signs are posted at each beach access point to warn the public about the beach and nesting areas restrictions (see attachment 11).

Nest sites are inspected daily during daylight hours to ensure nest markers and protection material remains in place and the nests have not been disturbed. Damaged and missing markers or materials are repaired or replaced as necessary to insure they remain visible to the public.

Nests that are laid seaward of the debris line marking the typical high tide in immediate danger of being damaged by sea waves or in areas of high erosion susceptibility are relocated in accordance with the approved PRDNER protocol for west relocations. Nests requiring relocation are moved not later than 9:00 a.m. in the morning following deposition to the nest relocation site approved by PRDNER (see photo of relocation site at attachment 12). The relocation site is marked and monitored in a manner consistent with in situ nests. If nest surveyors observe evidence of hatchling disorientation, PRDNER is immediately notified and a disorientation report is completed and submitted to PRDNER according to their requirements. Copies of such reports are also submitted to the contact office of the USFWS in Boquerón, Puerto Rico (see copy of an actual incident report at attachment 13). This information is also included in the annual reports submitted to the USFWS and to PRDNER. If possible, disorientation events are photographed or videotaped.

In the Palmas del Mar coast, ten-year data compiled from daily inspections between 2004 and 2013 shows that a total of 114 nests belonging to Leatherback sea turtles were identified (see table 1 below).

Table #1:

2004-2013 Palmas del Mar Leatherback Nesting Activity Summary

Year	Nests	Successful Nests	False Crawls	Destroyed by Waves	Unsuccessful Nests	Poached	Hatch Next Year
2013	0	0	0	0	0	0	0
2012	1	1	0	0	0	0	0
2011	2	1	0	1	0	0	0
2010	13	4	2	9	0	0	0
2009	15	6	2	7	1	1	0
2008	12	3	1	9	0	0	0
2007	37	13	3	15	7	2	0
2006	10	7	0	1	1	1	0
2005	14	1	4	12	1	0	0
2004	10	1	1	6	3	0	0
TOTAL	114	37	13	60	13	4	0

B. Hawksbill Sea Turtle (*Eretmochelys imbricata*)

1. *General Information*

The hawksbill sea turtle was listed as an endangered species in 1970. This sea turtle species is the smallest species in the Caribbean. The carapace is formed by scutellums of brown and yellow gold colors that are overlapping. Their head and fins are yellow colored with coffee spots.

The hawksbill sea turtle is found throughout the world's tropical waters (NMF and FWS, 1993). In the United States jurisdiction in the Caribbean Sea, hawksbills are most common in Puerto Rico and its associated islands, particularly in Mona, Culebra and Vieques (Van Dam and C. Diez, 1998) and in the U.S. Virgin Islands (NMF and FWS, 1993). Although hawksbills utilize a variety of nesting habitats, they have an apparent preference for remote beaches with dense shrubbery and little open sand in the vicinity of fringing reefs or rock outcrops (Witzell, 1983). Nesting usually takes place under the vegetation,

Nesting occurs throughout all the year, but the most important nesting months in Palmas del Mar is between from June through November. The major beaches for nesting activity in Puerto Rico are Mona Island, Caja de Muertos, and Culebra, PRDNER 2009). All the beaches along the Palmas del Mar coast are excellent for Hawksbill nesting.

2. *Nesting Survey Activity*

Palmas del Mar hawksbill nesting activity data between 2004 and 2013 is shown in table 2 below. The presence of hawksbill sea turtle takes place along the complete coast, including the pocket beaches in the Guayanés area along the promontories, the developed beaches and the undeveloped beaches through Buena Vista (see map at attachment 14). Hawksbills nesting at Palmas del Mar have been documented as early as January and as late as December.

In Palmas del Mar data compiled from daily surveys between 2004 and 2013 shows a total of 471 hawksbill sea turtles nests (see table 2 below). This data only includes detected nests as not all the nests can be registered since the hawksbill nests are typically small and under vegetation.

Table #2:

2004-2013 Palmas del Mar Hawksbill Nesting Activity Summary

Year	Nests	Successful Nests	False Crawls	Destroyed by Waves	Unsuccessful Nests	Poached	Hatch Next Year
2013	41	42	5	3	1	0	11
2012	50	21	16	5	5	5	14

2011	40	35	7	0	2	1	2
2010	26	18	5	8	0	0	0
2009	32	20	18	2	5	4	1
2008	59	45	44	8	4	2	5
2007	62	35	27	13	4	6	4
2006	82	69	30	0	1	6	6
2005	43	7	21	14	19	3	0
2004	76	30	51	10	33	3	0
TOTAL	471	322	230	63	74	30	43

Survey procedures and nest protection measures for the Hawksbill are the same as those followed with the Leatherback (see photo of actual nest at attachment 15).

IV. PROJECT IMPACT AND CONSERVATION MEASURES

This section will explain all the activities realized at Palmas del Mar that may impact the sea turtle habitat and the conservation measures being taken to reduce such an impact.

A. Beach Cleaning

1. *Description*

Most beach cleaning efforts involve the removal of marine seaweed (seagrass and sargassum), debris and other solid waste. Part of the trash found on these beaches is litter left by beach goers. Other trash is transported by inland streams and rivers. Marine debris includes seaweed and trash transported by the ocean currents that regularly reach the coast depending on the time of year, seagrass or sargassum wrack can be significant, to the point of impeding access to and from the water. Maurer et al (2015) documented the impacts of excess sargassum wrack on sea turtle nesting in Jumby Bay, Antigua. Marine debris has been identified as a significant national marine pollution problem (Faris, J and K. Hart, 1994). At Palmas del Mar, beaches are cleaned on a regular basis to enhance the sea turtles habitat.

The beaches at Palmas del Mar are cleaned manually and mechanically on a daily basis by a private company contracted by the Palmas del Mar Homeowners Association (PHA). At approximately 9:00 a.m., after nest survey is complete, the following routine is put into action:

- a. A designated person manually picks up trash and debris located landward of the average high tide mark and tosses it onto a platform, which is drafted by a tractor. This vehicle generally travels over the berm of the beach; that is, the sandy area above the high water marks.
- b. Seaweed and other debris are sifted by beach cleaning equipment designed to lift the debris and not the sand. The equipment used is the 600 HD Barber Surf Rake authorized by PRDNER and widely used to clean other beach areas in Puerto Rico (see attachment

16). These machines are effective in removing beach pollution such as seaweed, fish, glass, syringes, plastic, cans cigarettes, shells, stone, wood and virtually any unwanted debris. It is a unique mechanical rake operated by one person from the seat of a towing tractor.

2. *Impact on Sea Turtles*

The use of machinery to clean the beach can represent a threat to the survival of sea turtles nests and hatchlings if not done correctly or if inappropriate equipment is used or personnel is not properly trained on the specific procedures that must be followed to protect the habitat. Heavy equipment exerts a compacting effect on the nests and often break eggs within. Inappropriate raking of sand may also uncover turtle nests or the hatchlings striving to reach the ocean. Repeated compacting will kill developing embryos. Mann (1977) states that mortality within a nest may increase when externally applied pressure from beach cleaning machinery is common on soft beaches with large-grained sand (NMF & USFWS, 1992). This impact increases dramatically among sea turtles such as the hawksbill that make their nest just a few inches below the surface.

Tire tracks left by beach cleaning equipment are not only unattractive, they can be an obstacle for hatchlings trying to reach the sea, which run parallel to the sea. The hatchlings can fall into the tracks causing them dehydration under the sun and being easy prey for sea birds and other predators.

Also, inappropriate beach raking may increase erosion of sand at the beach through the removal of the initial barrier of seaweed to waves, wind and hurricanes or other natural forces. The Palmas del Mar beaches are characterized by dynamic and strong waves. Most of the nesting areas on these beaches are suffering from erosion.

The presence of garbage on the beach, especially solid waste such as plastics, cans and bottles, represent another threat for sea turtles. Garbage traps the hatchling as they strive to reach the ocean. Sea Turtles trapped in trash die of dehydration under the tropical sun and easily become prey to predators.

Seasonal accumulation of sargassum can actually impede a nesting turtle from reaching the sand beach or sea turtle hatchlings from reaching the water.

At Palmas del Mar, the species that could be most threatened by the inappropriate use of beach cleaning machinery is the leatherback. This species nests in dry sandy part of the beach, where the machinery passes on a daily basis. The hawksbill turtle also nests at Palmas del Mar, but this species chooses areas characterized by coastal vegetation beyond the cleaning equipment's reach. Nonetheless, hatchlings can be affected if correct measures and training is not observed.

3. *Conservation and Mitigation Measures:*

The following measures have been implemented for Sea Turtles Conservation during beach cleaning.

- a. During the sea turtle nesting season (all year) beach cleaning activities are confined to daylight hours after nests that hatched have been checked and new nests have been identified and properly marked.
- b. Beach cleaning personnel is trained and certified on an annual basis. Surveyors identify the locations of sea turtle nests before cleaning operations begin and inform those responsible for cleaning the beach area about the precise location of new nests.
- c. All nests left in situ are marked and protected with orange color material readily visible for maintenance personnel.
- d. Although personnel from the PRDNER or any other authorized qualified personnel are responsible for identifying sea turtle nests, the cleaning personnel have received training on an annual basis. This is necessary because people from the PRDNER and other qualified personnel inspect the beaches around 4:00 a.m. and there is a possibility that a turtle may lay its eggs after that time. Before the cleaning routine begins, clean-up
- e. Personnel inspect the beach to locate the nests marked by the PRDNER or by the Permittee surveyors. Any new nests detected during this period are immediately reported to PRDNER and other surveyors so they can take the necessary measures to protect the nests.
- f. No mechanical cleaning equipment is allowed inside the marked nests; however, careful removal of material by hand is allowed. All equipment operators are briefed on the types of markings utilized and have instructions on how to contact the individual responsible for the nest survey to verify the questionable areas.
- g. Mechanical cleaning is conducted during daylight hours after 9:00 a.m. once daily surveys are complete. Cleaning is limited to the area between the approximate water edge and the previous day's high tide mark or debris line. Debris landward of the high tide mark or debris line is removed manually as needed.
- h. Beach cleaning equipment is not allowed to encroach upon existing vegetation areas.
- i. Removal of accumulated debris from the beach takes place immediately after cleaning has been performed. No organic or inorganic debris is buried or stored on the beach. Organic debris are disposed outside the potential nesting area.
- j. In order to avoid an adverse impact in the event that cleaning accidentally occurs over a nest, mechanical beach cleaning equipment does not penetrate more than two (2) inches into the surface of the beach. The cleaning vehicle is restricted to a maximum tire pressure of 10 *psi* and a rake or cleaning apparatus which limits penetration into the surface of the beach to a maximum of two inches.

- k. Operators of mechanical beach cleaning equipment are trained to avoid all native, salt tolerant dune vegetation by a minimum of 10 feet.

4. *New proposed Conservation and Mitigation Measures*

When removing seaweed accumulation from the beach, the lowest impact techniques will be used whenever possible. Weather removal is done manually or mechanically, the following general guidelines will be observed:

- a. Seaweed and sargassum wrack removal activities should be conducted on an “*as needed*” basis due to the seasonal variability and accumulation rates of seaweed washed ashore. Determining the need to remove excess wrack accumulations will be made by sea turtle biologist in coordination with the beach maintenance crews.
- b. Wrack removal of should focus on the areas of significant accumulation of nuisance seaweed, leaving sufficient wrack line on the beach to provide a seed source, nutrient source and foraging habitat for shorebirds and to help build the beach and dunes.

B. Beach Vehicular Driving

1. *Description*

Beaches are often viewed as a playground for off-road vehicles and horse riding. Beach vehicular driving often includes the use of four-tracks, golf carts, beach cleaning machinery, emergency and police vehicles. In some areas of Puerto Rico the police uses horses to patrol beach areas and private citizens are also observed riding horse for pleasure in the coastal zones throughout the island. According to NMF and USEWS reports this is a serious problem that, although illegally, it persists in the US Virgin Islands and in Puerto Rico.

In the Humacao area horse riding in beach areas is prohibited by law and municipal ordinances. At Palmas del Mar golf carts are registered annually with PHA and are given a permit to operate in the established cart-paths of the community. While the large majority of carts are owned by residents others are rented by commercial establishments operating at Palmas del Mar. Golf cart owners, including commercial establishments in the rental business, are required to sign an agreement with PHA (see attachment 17) that establishes the rules for operating golf carts in the Palmas community and stipulates fines for the violation of these golf cart rules. These rules prohibit the operation of golf carts in the beach / maritime zone and impose a \$150 fine for the violation of this rule. Signs posted at the beach access points include beach vehicular and horse restrictions prohibitions.

The beach areas at Palmas del Mar have been identified by the by PR National Parks and Recreation Authority as unsafe for swimming due to the daily presence of very strong rip currents. The beach areas are posted with signs alerting people of this danger and instructing them in terms of what to do if caught in a rip current (see attachment18). Also, red flags identifying location of rip currents are placed along the beach area by the beach patrols. During beach high-visitor periods such as Easter Week, the 4th and 25th of July, literature, in Spanish

and English, explaining the red flag system, the nature of the rip current danger and what to do if caught in a rip current are distributed to the beach visiting public. In spite of these warnings beach goers often ignore them exposing themselves to this danger.

During the day beach patrols make beach safety rounds in four-track vehicles riding along the high water mark keeping an eye on beach visitors, issuing warnings to those who choose to enter the water and performing rescues of those caught in the currents unable to swim out. Also, beach patrols are tasked to intervene and issue fines to golf carts who may venture in the maritime zone. Except for beach cleaning equipment and beach patrol four-tracks no other vehicles are permitted in the maritime zone. Beach areas are off-limits at night and access points are closes at 6:00pm (see attachment 19). If necessary, night patrol of beach areas is done on foot.

2. *Impact on Marine Turtles*

Vehicles cause sand compaction which decreases hatchling success (Mann, 1977) or can crush pre-emerging hatchlings. The hatchlings emerge at night and the use of vehicles can strike and kill them while they are crawling to the ocean. Vehicle tire ruts can interfere with the ability of hatchlings to traverse the beach to the ocean. Also, vehicular activity can disturb nesting turtles resulting in aborted nesting attempts.

At Palmas del Mar the species that could be most affected should illegal driving in the beach be allowed is the leatherback. This species nests on the dry sandy part of the beach where vehicles could pass.

3. *Conservation and Mitigation Measures*

- a. Except for beach cleaning equipment performing functions as described in Section A above and beach patrols on four-track vehicles, all other beach vehicular driving activity as well as horse-riding activity is strictly prohibited. Prohibitions are enforced by Palmas del Mar beach patrols, the Puerto Rico Police and PRDNER officers. Signs alerting the public of these prohibitions have been posted at beach access entrances.
- b. The Palmas del Mar Homeowners Association Golf Cart Agreement with residents includes a provision that prohibits the use of golf carts on the beach and establishes a system of fines for such violations.
- c. Night preventive security patrols in beach areas are conducted on foot.
- d. Specific entry and exit points have been designated for four-track security beach patrols to access the beach when necessary. When access is necessary movement is limited to the high water mark.
- e. Beach patrol personnel are trained and certified annually on the Habitat Conservation Plan and Incidental Take Permit requirements and restrictions. Also, a standard

operations procedure (SOP) has been implemented regarding action that must be taken during any incidents involving sea turtles or nesting activity (see attachment 20).

- f. Vegetation has been planted and barriers erected to impede the illegal access of vehicles and horses to beach areas.

C. Recreational Structures on the Beach

1. *Description*

In Puerto Rico, restaurants, bars, parks and shops and golf courses are built right on the beach so as to provide services to the visitors without their having to leave the beach area. These structures are prohibited in the maritime zone but some of these structures are grand-fathered and have a permit from the PRDNER. This is the case of the Beach Bohio at Palmas del Mar. All future recreational structures shall be constructed off the beach.

The Beach Bohio is a raised, wooden structure facing the surf and located just a few meters from the water (see attachment 21). At times, in case of strong wave action, the structure may be just one meter or less away from the high water mark. The Beach Bohío offers drinks, fast food, a terrace overlooking the water, toilets and showers. This area is often used for activities and meetings.

2. *Impact on Marine Turtles*

The beaches of Puerto Rico are quite narrow and this precious space on the beach could best be used in a more active fashion by beach goers and nesting sea turtles. The recreational structures on the beach act as barriers, thus reducing the nesting area of marine turtles and interfering with the arrival of hawksbill turtles to vegetated nesting areas. The Beach Bohio is built four feet above the sand; however, the area underneath is completely enclosed to prevent any persons, animals or sea turtles from entering this space.

The illumination of such structures is another important factor to be considered, as sea turtle are highly influenced by light. Artificial light inland confuses nesting turtles and hatchlings, which may walk toward the light in their search for the sea.

Finally, human activity in and around these structures may disorient and disturb nesting females. Nocturnal human activity may cause nesting females to abort their attempts at some stage of the process. Murphy (1985) reports that such disturbances may cause sea turtles to abandon their nesting beaches, delay egg laying and select poor nesting sites (NMF and USFWS, 1992). Female hawksbills approaching a beach to nest are easily deterred by the presence of people and noise at these places.

3. *Conservation and Mitigation Measures at the Beach Bohío*

- a. The Beach Bohío structure has been modified in order to avoid harming the marine turtles at Palmas del Mar. The area beneath the structure has been enclosed so as to keep sea turtles from wandering in to lay their eggs.
- b. An illumination plan for the Beach Bohío has been implemented to comply with sea turtle protection and safety requirements. All lighting is being converted to low pressure sodium fixtures of 50 watts or less or yellow “bug” type bulbs. Lighting will be minimized through reduction in numbers, shielding, recessing, lowering and appropriate placement to prevent the glowing portion at any light fixture from being directly visible from anywhere in the beach (see corrective action items at attachment 22).
- c. Activities or events at the Beach Bohío are being concluded not later than 11:00 p.m (see attachment 23). At this time all lighting and music is turned off except minimum lighting needed by maintenance personnel. Maintenance personnel must complete their work not later than midnight and all remaining lighting is turned off by that time.

D. Recreational Beach Equipment

1. *Description*

Recreational beach equipment includes beach chairs, umbrellas, tables, surfboards, towels and other accouterments used by beach goers. Crescent cove, Crescent Beach, Wyndham Hotel and areas of private residences all offer such services. Beach Village Regimes do not provide beach equipment to their owners, however, owners themselves often bring chairs to the beach on their own. Crescent Cove and Crescent Beach have an itinerary for the use of this equipment. In addition, they have a bulletin with the rules and regulations of the condominium and a highly visible notice for users of the facilities. They also have personnel in charge of collecting and putting away the recreational equipment in the beach area. The storing places for this equipment are off the beach.

2. *Impact on Sea Turtles*

The placement of physical obstacles such as lounge chairs, umbrellas, tables, towels, surfboard, toys, etc. on nesting beaches can hamper or deter nesting attempts and interfere with the development of incubating eggs as well as with the seaward approach of hatchlings. The multitude of umbrellas and sunbeds that usually litter beaches can present an impenetrable barrier to an egg laden turtle, causing her to return to the sea or lay her eggs in an inappropriate site. Adult sea turtles females may also be trapped in beach chairs or sunbeds and may be injured as they try to escape.

Even innocently dug sandcastles can become impenetrable mountains or ditches to newly hatched turtles, frustrating their attempts to reach the shore. Over time, the heavy and constant use of a beach by tourist can completely change the nature of the sand through compaction. This reduces growth rates in embryo sea turtles and increases the mortality of hatchlings.

3. *Conservation and Mitigation Measures*

Recreational beach equipment including deck chairs, umbrellas, sunbeds, or lounge chairs are kept out of the nesting area and are required to be removed from the beach by dusk. Beach rules clearly state that all such equipment would be removed by 6:00 PM (see attachment 24). Nocturnal use is prohibited.

Beach equipment is stored in designated areas behind the vegetation of the beach so as not to interfere with the life cycle of endangered sea turtles (see attachment 25). When beach chairs are found by surveyors during their morning inspections they immediately contact Palmas Security. Palmas Security in turn contacts PHA maintenance personnel who then proceed to remove the equipment from the beach. Owner of the equipment is notified about the restrictions and penalties associated with non-compliance with this requirement. If equipment is not claimed by the owner, PHA disposes of the items (see attachment 26).

E. Beachfront Lighting

1. *Description*

Artificial beachfront lighting from buildings, streetlights, dune crossovers, vehicles and other types of beachfront lights have been documented as a cause of disorientation (incorrect orientation or loss of bearings) of hatching turtles (McFarlane, 1963; Philiposian, 1976; Mann, 1977; Ehrhart, 1983). The NMFS and USFWS in 1992 wrote: "The background glow associated with intensive inland lighting, such as that emanating from nearby large metropolitan areas, may deter nesting females and disorient hatchlings navigating the near shore waters. Cumulative, along the heavily developed beaches of the southeastern continental United State and Puerto Rico, the negative effects of artificial lights may be profound."

2. *Impact on Sea Turtles*

Hatchling emerging from the nest and adult female nesting during the night are strongly attracted to light sources along the beach. The sea turtles so misled fail to find their way to the sea, succumbing to attacks by predators, exhaustion, drying in the morning sun, or strikes by automobiles on nearby parking lots and roads. The problem of artificial lights in the beach is not restricted to hatchlings. The adult female's sea turtles can become disoriented and traveling inland toward a light.

3. *Conservation and Mitigation Measures*

In Puerto Rico the program for the Control and Prevention of the Lighting Pollution of Puerto Rico (Act #218 approved in the year 2008), and the 2014 PR Environmental Quality Board (PREQB) Regulation on the Control and Prevention of Light Contamination clearly establish public policy that acceptable illumination fixtures are those that shield the light source to minimize glare impact on habitats. This act applies to existing and new construction and for private lighting systems and will be used to develop new strategies to eliminate excessive

lighting in all areas but in particular in beach zones. At Palmas del Mar the development of new projects is under the control of the Palmas del Mar Homeowners Association Architectural Review Board (PHA-ARB). The PHA-ARB Design Guidelines for new construction now provide design parameters for the installation of outside illumination to ensure they comply with the Control and Prevention of Lighting Pollution Act No.218, the PREQB Regulations and provide examples of acceptable/unacceptable lighting fixtures to eliminate possible illumination sources that may cause disorientation for nesting sea turtles in de shores of Palmas del Mar (see attachment 27). ARB restrictions include:

1. Security lighting for construction equipment and storage will be shielded so as not be directly visible from the beach.
2. Exterior Lighting Fixtures shall be low pressure sodium luminaries with 50 watts maximum output, or equivalent compact fluorescent or LED luminaries with similar color rendering. Where possible, light sources shall be shielded from view.
3. Keep permanent light sources from directly, indirectly, or cumulatively illuminating the beach such that distinct shadows could be cast on the beach on a moonless night.
4. Use the lowest wattage possible to accomplish the lighting task of providing safety and security.
5. Use directional luminaries directed down and away from the beach. Use shield on luminaries to prevent light from reaching the beach. Up-light illumination is not permitted.
6. Use low, louvered bollard fixtures rather than pole mounted luminaries, where possible.
7. Position luminaries to take advantage of potential light shields such as walls, buildings, vegetation, etc.
8. Use motion detector switches for safety and security lights.
9. Plant landscape vegetation as a lighting buffer where applicable and maintain existing vegetation.
10. Design and locate parking areas and roadways to minimize vehicle headlights from directly or indirectly illuminating the beach.
11. Restrict vehicles from the beach at all times, other than security and/or emergency vehicles. Train personnel using security and emergency vehicles to identify and avoid nests.

12. Design and locate interior fixtures that will reduce lights spillage from within ocean-facing rooms.

Considerable investments have been made by beach-front residential areas included in the Permit to bring those areas in compliance with the Habitat Conservation Plan and the USFWS 2003 incidental Take Permit. The positive change in the illumination of the coast line has been dramatic. This was the result of several inspections conducted by USFWS and PHA inspectors working together in the early years of the 2003 Incidental Take Permit. These periodic inspections continue today and are conducted by the PHA contracted Wildlife Biologist Ingrid Flores who performs the sea turtles surveys and reporting programs. When problems are detected, reports are immediately generated and letters compelling corrective action are sent by the PHA. As a result of the actions taken over the past 10 years in the Permit area, the following light management measures have been implemented:

1. All lighting is at the minimum necessary to comply with safety requirements. All lighting has been converted to low pressure sodium fixtures (50 watts or less) or yellow "bug" type bulbs. Lighting has been minimized further through reduction, shielding, recessing, lowering and appropriate placement of lights to prevent the glowing portion of any light fixtures (including the lamp, globe, or reflector) from being directly visible from anywhere on the beach. Up-lighting is now prohibited.
2. Roadways or parking lots lighting fixtures within the project area are kept to a minimum and are positioned, lowered, mounted, or shielded .to prevent the glowing portion of any light fixtures (including the lamp, globe, or reflector) from being directly visible from anywhere on the beach. Fixtures that result in up lighting are prohibited. The light emanating from such fixtures cannot directly or indirectly illuminate the beach. Native dune vegetation, hedges, or similar ground-level barriers are being utilized where necessary to ensure this objective is met.
3. Lights on walkways consist of either low wattage linear tube lighting installed at foot level in recessed grooves or low pressure sodium bollard lights with louvers. Up-lighting is prohibited.
4. Floodlights, spotlights, and other lighting for purely decorative purposes is not used on the seaward side of any buildings and, if used on the landward side of buildings, are directed downward and limited in number and intensity.
5. Swimming pool lighting is kept at the minimum necessary to meet safety requirements. Lighting has been minimized through reduction of number of light fixtures, shielding, recessing, lowering, or appropriate placement of lights to prevent the glowing portion of

any light fixtures (including the lamp, globe, or reflector) from being directly visible from anywhere on the beach.

6. Exterior lights used expressly for security purposes have been limited to the minimum number necessary. The use of motion detector switches that keep lights off except when approached and that switch lights on for the 'minimum duration possible are being used.

F. Landscaping

1. *Description*

Buildings in Palmas del Mar and other coastal areas in Puerto Rico are built close to the maritime zone. Often native vegetation is cleared and replaced with other species such as grass, or other exotic plants and at times areas are left without any vegetation. Sand is replaced with garden soils. The exposed beaches are then subject to strong winds which transport the sand away from the near shore. Golf courses built near the coast have often resulted in the reduction of much of the native vegetation which has been replaced by grass.

At Palmas del Mar golf courses and coastal residential areas are separated from the maritime zone by vegetation such as sea grapes, beach plum, sea reeds, escabola, coconut palm trees and almond trees, among others. Some areas in Palmas del Mar such as Plaza del Mar, Beach Village, Crescent Cove and Crescent Beach have coastal vegetation, primarily sea grapes, which are maintained to a minimum of four feet of height.

2. *Impact on Sea Turtles*

Building close to the water edge creates many potential impediments to nesting turtles. The absence of coastal vegetation will force the hawksbill turtle to go further inland in search of an appropriate nesting area. This turtle tends to nest under the vegetation so the elimination of such areas adversely affects the hatching process. By moving further inland, the turtle may be confused by the bright lighting and will also be easy prey to predators. Eliminating the vegetation also alters the thermal regime necessary for incubating eggs, thus affecting the hatching process and altering natural sex ratios (NMFS and USFWS, 1993). Several species of plants can be lethal to the development and hatching of sea turtle eggs. Casuarina and sea oats (*Uniola*) have fast-growing roots which render the turtle habitat unfit for nesting (NMFS and USFWS, 1993).

The substitution of sand for soil also affects the nesting process adversely. Soil tends to be more compact making it more difficult for the turtle to make its nest. Even if it does succeed in making

its nest in the soil, hatching may not be successful. The vegetation planted in the beach areas should be tolerant of salinity and strong winds and should be able to grow well in the sand or beach sediments.

When golf courses are built close to the beach they could allow sea turtles to enter the course searching for a place to nest. In October, 1997 a female hawksbill made its nest in one of the sand traps on the golf course (Montero, 1997). Once they are on the golf course the turtles could be further attracted by the residential lights which may confuse their sense of orientation. No other incidents of this nature related to golf course operations have been registered since 1997 at Palmas del Mar.

3. *Conservation and Mitigation Measures*

Not all landscaping efforts need to be detrimental. Landscaping with proper planning can support nesting of hawksbill sea turtles while still being pleasant for humans.

At Palmas del Mar vegetation along the coast has been restored by the various residential areas and/or the developers with native vegetation plants proper to the area such as sea grapes, escabola, West Indian creeper, beach morning glory, palm trees, beach plum, among others. Landscaping no longer entail the substitution of sand with soil so it does not disrupt the nesting process of the turtles. The height of the vegetation is being maintained at least at four feet in order to serve as a natural barrier and to filter out disruptive lights. The vegetation also helps in the control of erosion, provide shade and produce beautiful scenery. A barrier using native coastal vegetation is vital to reduce disorientation problems

Palmas del Mar restrictions prohibit the removal of natural front-beach vegetation without the specific approval of PRDNER and copies of such approvals must be filed with the PHA-ARB.

G. Education: A Strategy for Sea Turtle Conservation

The absence of educational projects aimed toward the conservation of sea turtle contributes to an apathetic attitude among residents, tourist and administrators toward the serious efforts being made to save these endangered resources from extinction. Clearly, in order to promote changes in attitude and behavior, it is essential to start with a good education program.

Environmental education projects specifically designed for Palmas del Mar Resort have been developed and include:

1. Information to the guests, employees and community about sea turtle conservation through articles, symposiums and conferences.

2. Signs have been posted at nesting beach entrances with information, rules and regulations.
3. Education of tourists on laws regulating commerce in endangered and threatened wildlife.
4. The dissemination of educational materials, including pamphlets, flyers, signs, stickers, posters, etc. designed to inform residents and tourists about how to behave in relation to sea turtles and their marine and shoreline habitats (see attachment 28).
5. Incorporation of sea turtles-related clauses in the rules and regulation of each regime and purchase of apartments, villas and golf carts.
6. Training of security and beach maintenance personnel on managing emergency situations related to sea turtles.
7. Workshops for teachers at Palmas del Mar Academy so that they may incorporate in their curriculum units on sea turtles and the importance of conserving all endangered species.
8. Exhibition area and seminars in the Beach Bohío. An information display is been placed in a board at the Beach Bohio to educate visitors and customers about sea turtle conservation. This area is very accessible to the public to obtain that information.
9. Formation of Volunteer Groups. A group of volunteers known as “Pal Carey” has been formed to assist PHA and its surveyors in the execution of the Palmas del Mar HCP. The group has received conferences and attended workshops on all aspects of sea nesting activities, compliance and reporting. The group is very active in promoting beach cleaning activities (see attached photos and related articles in attachment 29).

V. NEW AREAS BEING ADDED TO THE PROJECT PROPERTY

Five areas not previously included in the Project property are being added to the Palmas del Mar Habitat Conservation Plan (HCP) and to the new Permit. These areas are Marbella Club, the Beach Club, Solarea, Palmas Doradas and Plaza del Mar (see attachment 30). It is important to note that while these areas were not part of the previous HCP or ITP they have been continuously monitored as part of the ongoing Palmas sea turtle monitoring program and any nesting or sea turtle activity has been included in the monthly and annual reports.

As part of this permit renewal process these areas have been evaluated and a summary of findings and conservation recommendations is hereby included. Some of these areas, Marbella Club in particular, require considerable modifications to their current illumination layout in order to become fully compliant with the Habitat Conservation Plan and the Permit requirements. Although corrective action is being implemented, it is estimated that it may take close to a year

before the area is fully compliant. As it was done with the original Permit, the Permittee is requesting a year from the Permit date to allow all new areas become in full compliance.

The current situation in the new areas is as follows:

1. Marbella Club

The Marbella Club is a condominium located between the Beach Club and the Candelero River (see attachment 31). It consists of five five-story buildings each containing 30 residential apartments. Construction of this complex was completed in 2008. Vegetation separates the condominium common areas from the beach. Potential problem areas, mainly illumination and the planting of additional vegetation, requiring implementation action once this HCP is approved, are included in the inspection report prepared by Wildlife Biologist Ingrid Flores (see attachment 32).

2. The Beach Club.

The Beach Club is a major recreational amenity that serves the community of Palmas del Mar and the members of the Palmas Athletic Club. It was built and has been operational since 1999. The Beach Club is located adjacent to the Marbella Club complex (see attachment 33). Recreational facilities include swimming pool areas for adults and children, an aquatic park with slides and water playground equipment, Jacuzzi, restaurant, ping-pong tables, sun-bathing decks and direct access to the beach.

The Beach Club operates from 9:00 am to 6:00 pm daily and holds occasional activities at night. Although not included previously as part of the Project properties, the Beach Club has been monitored and surveyed on a daily basis and is in full compliance with the Habitat Conservation Plan and the provisions of the 2003 Incidental Take Permit. There has been no sea turtle related incidents associated with the Beach Club during the 2003-2014 period.

No significant deficiencies requiring an action plan as part of this permit is required. A few light bulb changes is the only item requiring action.

3. Solarea

Solarea is the first phase of the developed project located between the Beach Club and Crescent Beach (see attachment 34). It is a 32 acre parcel, that in accordance with the Palmas del Mar master development plan, once fully developed it contemplates a total of 300 condominium units and a 200 room hotel. The property sits in Punta Candelero, one of the favorite beach spots at Palmas del Mar.

Currently Solarea consists of seventy four residential apartments spread among four five-story buildings. These units are far removed from the beach as they are in front of Candelero Avenue. However, future developments in this parcel of land will be closer to the maritime zone thus requiring possible mitigation and prevention measures to avoid a possible impact upon nesting areas.

The Palmas del Mar Homeowners Association Architectural Review Board (PHA ARB) will be reviewing and indorsing any future development plans in this area. Whenever those plans are presented in the future, the PHA ARB will ensure that any construction to include the installation of luminaries, vegetation, erosion control measures such as concrete filled sand bags or rock revetment (T-groins) already permitted and endorsed by PRDRNA and the US Corps of Engineers and any physical barriers that meet the PHA ARB guidelines applicable to beach-front property for compliance with this Habitat Conservation Plan and any restrictions that may be contained in the new Permit for the proposed Project properties.

Although not included previously as part of the Project properties this area is being monitored and surveyed daily. Any nesting activity in this area is being included in our monthly and annual reports. See attachment 35 for Solarea corrective action items that need to be implemented in the next twelve months following approval of this HCP.

4. Palmas Doradas

Palmas Doradas is a fully developed project partially located between Crescent Cove and the Beach Bohio. The development complex consists of 70 residential apartments completed in 2003. The main portion of this complex is a four story building containing 54 units. This building sits in front of Candelero Avenue away and not visible from the maritime zone. However, the complex has another four two-story structures each housing four apartments. One of these structures sits behind the complex next to the maritime zone not too far from the Beach Bohio (see attachment 36).

Although Palmas Doradas was not included as part of the project properties covered by the previous Permit, the area has been monitored and surveyed on a daily basis and they are in full compliance with the Habit Conservation Plan and the Permit requirements. In 2004 they voluntarily modified lighting fixtures in the structure near the maritime zone and have adopted every recommendation made by our surveyors from time to time. See attachment 37 for the Palmas Doradas corrective action items needing implementation once this HCP is approved.

5. Plaza del Mar

Plaza del Mar is a relatively new development complex completed in 2012. The condominium was designed incorporating the PHA ARB Architectural Design Guidelines which contain guidance for the installation of luminaries and vegetation consistent with the PHA Habitat Conservation Plan and the 2003 Incidental Take Permit.

The project consists of 24 residential apartments divided among two five-story buildings located between Coqui Park and the marina flushing channel and next to the maritime zone (see attachment 38). The complex is separated from the maritime zone by a dense plantation of sea grapes maintained at a four feet minimum height. Although nesting activity has been reported in this area no incidents or disorientations can be attributed to the complex. The area is monitored and surveyed on a daily basis and any nesting or sea turtle related activity is included in our monthly and annual reports.

As part of this Permit application, a close inspection of Plaza del Mar has been conducted by our Wildlife Biologists Ingrid Flores in charge of our monitoring and survey program. Minor potential problem areas, mainly illumination, have been identified for corrective action as part of this plan (see report survey at attachment 39) and will be implemented over the coming twelve months following approval of this HCP.

VI. FUNDING

The Palmas Homeowners Association (PHA) and the condominiums subject to the Habitat Conservation Plan and to the USFWS Incidental Take Permit will be responsible for the measures contemplated in this Habitat Conservation Plan. Funding assistance may be required from USFWS or other federal or state agency for the implementation of this plan. PHA includes in its annual budget the costs of monitoring, surveying and reporting activity by its surveyors as well as the costs associated with the maintenance of nests and nesting areas. Also, the cost of public education and awareness programs are paid by PHA.

VII UNFORSEEN EVENTS

Palmas del Mar, because of its location, can be subject to unforeseen weather events such as tropical storms or hurricanes. These events can cause unexpected changes in the shoreline, increase erosion, deposit huge amounts of wrack, etc. As soon as safely possible after such a weather event, Palmas contract biologists will survey the beaches for impacts to sea turtle nesting habitat. Other events such as increased arrival of sea borne sargassum, drought, etc. will be evaluated on an event basis. Loss of turtle nests due to unforeseen events will be documented and possible corrective actions can be presented to the PHA, DRNA and the Service. Sea level rise due to climate change can also impact sea turtle nesting habitat. Sea turtle monitors will note any changes in tide marks, or high tides that become permanent. Increases in the need to relocate nests due to high water, nests lost from erosion and loss of open beach habitat will be noted on the sea turtle survey reports.

VII. LITERATURE CITED

- Cintrón, G. and B. Cintrón. 1987. National Report for Puerto Rico to the Western Atlantic Turtle Symposium II – October 1987, Mayaguez, Puerto Rico. 56p .
- Departamento de Recursos Naturales y Ambientales de PR, 2009. Amenazas Técnicas de Manejo para prevenir la Destrucción y/o Degradación de las Playas de Anidaje de las Tortugas Marinas en Puerto Rico.
- Ehrhart, L.M. 1983. A Survey of Nesting by the Green Turtle, *Chelonia mydas*, and Loggerhead Turtle, *Caretta caretta*, in South Brevard County, Florida. Unpubl. Report to World Wildl. Fund-U.S., Washington, D.C. 49 p.
- Faris, J. and K. Hart. 1994. Seas of Debris: A Summary of the Third International Conference on Marine Debris. N.C. Sea Grant College Program. 54 p.
- Mann, T.M. 1977. Impact of Developed coastline on Nesting and Hatchling Sea Turtles in Southeastern Florida. Unpublished M.S. Thesis. Florida Atlantic University, Boca Raton, Florida.
- Matos, R. 1986. Sea Turtle Hatchery Project with Specific Reference to the Leatherback / (*Dermochelys coriacea*), Humacao, Puerto Rico, 1986. Annl. Rept., Puerto Rico Department of Natural Resources. 23 p.
- Maurer, A. S., De Neef, E., & Stapleton, S. 2015. Sargassum accumulation may spell trouble for nesting sea turtles. *Frontiers in Ecology and the Environment*, 13(7), 394-395.
- McFarlane, R.W. 1963. Disorientation of Loggerhead Hatchlings by Artificial Road Lighting. *Copeia* 1963: 153.
- Montero, L.L. Unpub. data Reporte Anual Proyecto de Conservación de Tortugas Marinas 1997: *Eretmochelys imbricata* y *Dermochelys coriacea*. Departamento de Recursos Naturales y Ambientales de Puerto Rico y Programa de Colegio Sea Grant del Recinto Universitario de Humacao.
- Montero, L.L. Unpub.data. Reporte Anual Proyecto de Conservación de Tortugas Marinas 1998: *Eretmochelys imbricata* y *Dermochelys coriacea*. Departamento de Recursos Naturales y Ambientales de Puerto Rico y Programa de Colegio Sea Grant del Recinto Universitario de Humacao.
- Murphy, T.M. 1985. Telemetric Monitoring of Nesting Loggerhead Sea Turtles Subjected to Disturbance on the Beach. Paper Presented at Fifth Annual Workshop on Sea Turtle Biology and Conservation, 13-16 March 1985, Waverly, Georgia.

- National Marine Fisheries Service and United. State Fish and Wildlife Service, 1992. Recovery Plan for Leatherback turtles in the US Caribbean, Atlantic and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C. 65 p.
- National Marine Fisheries Service and US Fish and Wildlife Service. 1993. Recovery Plan for Hawksbill Turtles in the U.S. Caribbean Sea, Atlantic Ocean and Gulf of Mexico. National Marine Fisheries Service, St. Petersburg, Florida. 52p.
- Philibosian, R. 1976. Disorientation of Hawksbill turtle Hatchlings, *Eretmochelys imbricata*, by Stadium Lights. Copeia 1976: 824.
- Pritchard, P.C.H., and P. Trebbau. 1984. The Turtles of Venezuela. Society for the Study of Amphibians and Reptiles, National Research Council (NRC). 1990 Decline of the Sea Turtles: Causes and Prevention. National Academy Press, Washington, D.C.
- Puerto Rico Environmental Quality Board, 2014. Regulation for the Control and Prevention of Light Contamination.
- United States Fish and Wildlife Service, 1991. The Five Sea Turtle Species of the Atlantic and Gulf Coast of the United States. U.S. Government Printing Office.
- United States Fish and Wildlife Service. Unpub. Data. 1992 Annual Report Culebra Sea Turtle Conservation Project.
- Van Dam and C. Diez 1998. Mona and Monito Island Hawksbill Turtle Research Project. Chelonia, Inc. and PR Department of Natural and Environmental Resources.
- Witzell, W.N. 1983. Synopsis of Biological Data on the Hawksbill Turtle, *Eretmochelys imbricata* (Linnaeus, 1766). FAO Fisheries Synopsis No. 137. 78 p.

VIII. LIST OF ATTACHMENTS

1. 2003 USF & WS Incidental Take Permit
2. Sea Turtle Monthly Survey Report
3. 2013 Sea Turtle Survey Annual Report
4. PRDNER Nest Relocation Permit
5. Map of Palmas del Mar
6. Developed Beach Areas
7. Undeveloped Beach Areas
8. Map of the Project properties
9. Map of Actual Leatherback Nesting Area
10. Photo of Leatherback Nest
11. Photo of Beach Access Warning Signs
12. Photo of Nests Relocation Site
13. Copy of HCP Incident Report
14. Map of Hawksbill Nesting Area
15. Photo of Actual Hawksbill Nest
16. Barber Surf Rake Cleaning Equipment
17. PHA Golf Cart Agreement
18. Photo of Rip Current Signs
19. Beach Access Hours
20. Beach Patrol SOP
21. Photo of Beach Bohio
22. Beach Bohio Illumination Correction Plan
23. Sign of Beach Bohio Operating Hours
24. Beach Chair Removal Hours
25. Beach Chairs Storage Area
26. PHA Instructions for Disposal of Beach Chairs Violating HCP

27. ARB Design Guidelines
28. Samples of Public Education Materials
29. P'al Carey Volunteers Activities
30. New Project Property Areas
31. Aerial Photo of Marbella Club
32. Ingrid Flores Survey Report of Marbella Club
33. Aerial Photo of Beach Club
34. Aerial Photo of Solarea
35. Solarea Corrective Action Items
36. Aerial Photo of Palmas Doradas
37. Palmas Doradas Corrective Action Items
38. Photo of Plaza del Mar
39. Ingrid Flores Report on Plaza del Mar