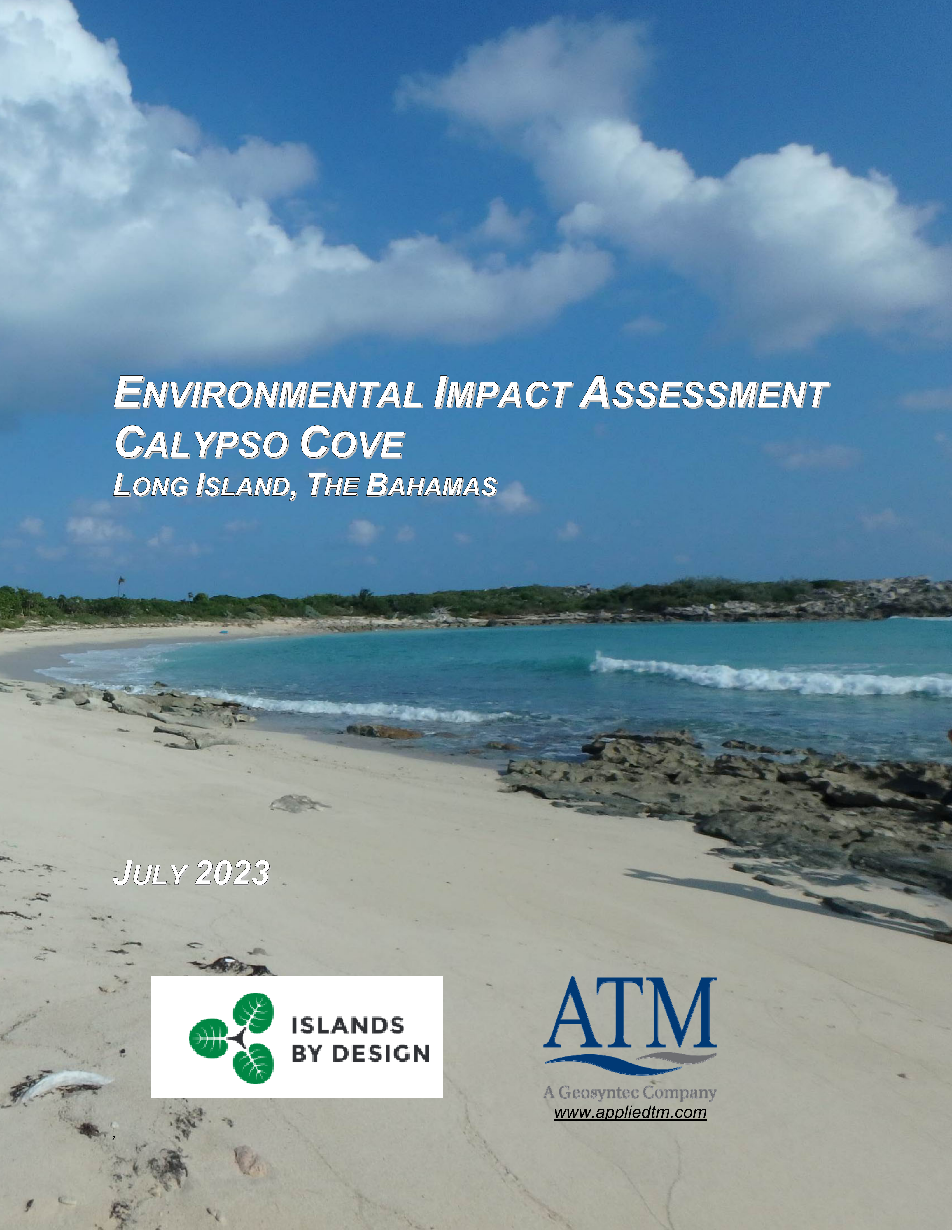

ENVIRONMENTAL IMPACT ASSESSMENT
CALYPSO COVE
LONG ISLAND, THE BAHAMAS

JULY 2023

ISLANDS BY DESIGN

ATM
A Geosyntec Company
www.appliedtm.com

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Executive Summary

A consulting team composed of senior staff at Islands by Design and Applied Technology and Management, a Geosyntec Company (ATM), have completed this Environmental Impact Assessment (EIA) for the proposed development of a cruise ship port and visitor experience areas near the southern terminus of Long Island, The Bahamas. The planned out-island project is expected to be used for day and overnight visits. Activity opportunities are expected to include restaurants, a straw market, sunbathing, nature walks, snorkeling, boating, kayaking and other water sports and offsite excursions to other tourist destinations on Long Island (e.g., Dean's Blue Hole, fishing, etc.).

Full build-out of the proposed project will consist of two phases. Phase 1 consists of development on a 350-acre privately owned tract near the southern tip of the island that will house the berthing area for a maximum of three cruise ships and other visitor use areas, and use of adjoining lands that are presently Crown Lands.

No site plan currently exists for Phase 2, however, the intent is for the future development on the tract situated immediately northeast of the Phase 1 cruise ship destination parcel and potential use of a non-contiguous 230-acre parcel located approximately three miles to the north. This EIA solely describes conditions and potential impacts that could result from the construction and operation of Phase 1. It is recognized that a new (or amended) EIA would need to be developed and approved by the Government prior to development of Phase 2 and/or any other future phase(s).

For Phase 1, the Developer intends to maintain a portion of the property in its present vegetative communities, with clearing of uplands for construction of visitor use area, restaurants, recreation areas, water sport facilities, transportation roads, paths and nature walks, roadways, and the utilities necessary to support these facilities.

Calypso Cove will prove to be a regenerative engine that will increase both populations and economic activity by way of personal and commercial consumption in the form of both direct and indirect commercial engagement.

The areas proposed for use are presently vacant, although review of historical aerial photography indicates that portions of the tract have been cleared and may have previously been used for agricultural purposes. Electricity currently extends to the north boundary of the property, which presently does not have water or sewer services. The proposed development will require construction of a water plant and a sewage treatment plant. Fuel and fuel storage will be required for operation of the utility plant. Wastewater will be treated and used for irrigation purposes to enhance natural growth of vegetation and for toilet and urinal flushing.

The project team is committed to the development of the site utilizing the most comprehensive and state-of-the-art environmental technologies and management methodologies. Careful consideration has been given to the environmental impacts and sequence of development activity to minimize long-term and short-term adverse impacts to the upland and marine ecology, local infrastructure, and cultural resources. Toward this goal, the following project components and methodologies will be implemented.

Clearing for all required areas will be limited to the immediate area necessary for construction and amenities. Land clearing in adjacent areas will be restricted to thinning the underbrush, selective removal of poisonous plants from within public use areas, and clearing areas with invasive or low resource value vegetation.

- Landscaping around public and common areas will make extensive use of the diverse selection of native trees representative of Long Island.
- The development of the marine berthing area will utilize state-of-the-art best management practices (BMPs) to minimize impacts. A detailed summary of BMPs to be implemented during construction and operations will be provided in the Environmental Management Plan (EMP) under separate cover.
- Similarly, a comprehensive beach management program will be established to provide information, environmental management, and safety for the visitor use beach areas.
- Currently, a variety of human-related debris (e.g., derelict vessels, including their batteries and other ancillary hardware, entangled fishing nets, etc.) exists in the marine environment adjacent to the property. A comprehensive cleanup of the existing beach and coastal areas will be conducted.

- All water and wastewater infrastructure will be constructed onsite, providing for non-existent or minimal impacts to adjacent community water and wastewater infrastructure. Food waste will be incinerated onsite, and landscape clippings will be mulched or landfilled. The remaining solid waste will be removed from the site and appropriately disposed. Waste transported by ship will include metals and plastic. During construction, waste wood products will be burned and waste concrete products will be recycled to the extent possible and otherwise landfilled.

To develop the EIA, a variety of desktop and field studies have been completed to identify and map important natural and cultural resources. The studies included the following:

- Quantitative and qualitative mapping of landside vegetative communities, including water features;
- A bathymetric survey of areas where the proposed ship berthing area is proposed; and
- A qualitative reconnaissance survey and mapping of dominant species within the marine habitats in the areas of interest around the site with descriptions of dominant marine species and benthic communities.

These studies serve as the baseline to design and develop the site in a manner that minimizes environmental impacts and, where possible, preserves and enhances the natural and cultural resources of the surrounding area. These studies also provide the baseline conditions upon which positive and negative impacts have been quantified. The following summarizes the key impacts, both positive and negative, defined in this EIA.

- Approximately 152.4 acres of upland habitat will be impacted due to clearing for the development. This will result in the reduction of habitat for some species of migratory and resident birds and other landside animals.
- Approximately 60.3 acres of submerged land is proposed to be altered to create the cruise ship berthing area. The direct impacts of this aspect of the project will result in impacts to 38.4 acres of existing hardbottom with macroalage and 14.6 acres of hardbottom with submerged aquatic vegetation. The conversion of existing benthic habitat to deep water berth will result in a lower carrying capacity for fish species and

other marine life resident within the basin, as well as those juvenile species that only temporarily use the nearshore areas prior to moving offshore or to other areas.

- Improvement of beach areas along the southwest facing shoreline will be done by removing *Casuarina* trees. No fill, breakwaters, jetties, groynes or other infrastructure are proposed to be added to the beach, so no direct impacts to the nearshore bottom are expected to occur from construction aside from the berthing area impacts previously identified and the reclaimed land as part the berthing area.
- The east shoreline of the project is proposed to remain intact, but hiking trails, roads and other infrastructure are proposed in that area to provide visitors access to the beach in Folley Bay and the adjacent coastline.
- No significant erosion or accretion of sand or sediments are expected to occur from the construction of the berthing basin and associated wharf construction.
- Efforts will be made to ensure that construction and dredging impacts to water quality in the ship basin and adjacent waters of the island will be short term and limited by using site-specific controls and turbidity reduction and containment measures.
- Potential adverse impacts to notable fish species have been minimized by designing a fish movement corridor between the southern tip of the island and the proposed berthing area.
- Impacts to cultural and historical resources on the island will be minimized through a comprehensive study of the resources on the island in cooperation with the government.
- This EIA presents the preliminary design and planning conducted to date for the development of the Calypso Cove project and the environmental and cultural impacts associated with the conceptual master plan. Additional planning and detailed design efforts will be conducted in accordance with the objectives of this EIA document, with additional details to be provided to the Government of the Bahamas as addendums to this EIA as details of the project are refined.

1.0 Introduction and Objectives

1.1 Objective of the Environmental Impact Assessment

This report provides an Environmental Impact Assessment (EIA) for the proposed Calypso Cove project in the southern part of Long Island. The proposed project consists of two contiguous properties (Figure 1-1). A berth for up to three cruise ships and various visitor use areas are proposed to be constructed on a 350-acre privately owned parcel and existing Crown lands located at the southern tip of the island (Figure 1-2). Back-of-house (BOH) infrastructure (e.g., worker housing, utility facilities, etc.) are proposed to be constructed during a future phase, on a non-contiguous, approximately 230-acre parcel located about three miles to the north (not included in this EIA).

As proposed, more than 60 percent of existing landside communities will remain undisturbed. To minimize dredging in open marine water areas, the Developer is also applying for approval from the Government of The Bahamas to use Crown Lands to create a berthing basin for cruise ships.

This report has been developed in accordance with a Terms of Reference (ToR) that was issued by the Government's Ministry of the Environment and Housing's Department of Environmental Planning and Protection. The proposed development includes snorkeling areas, nature walkways, dining areas, ocean swimming/beach areas, retail, entertainment, and support services, all to be used primarily on a day-use basis when one or more ships are in port.

1.2 Scope of the Environmental Impact Assessment

In general, this effort has included detailed evaluations of the project site itself and the various plans proposed. The EIA summarizes the potential significant physical and environmental impacts and benefits attributable to the chosen plan.

Because secondary and/or indirect impacts may extend outside the boundary of the proposed project, the areas assessed include marine areas up to 1,500 feet (ft) [about 457 meters (m)] from shore.

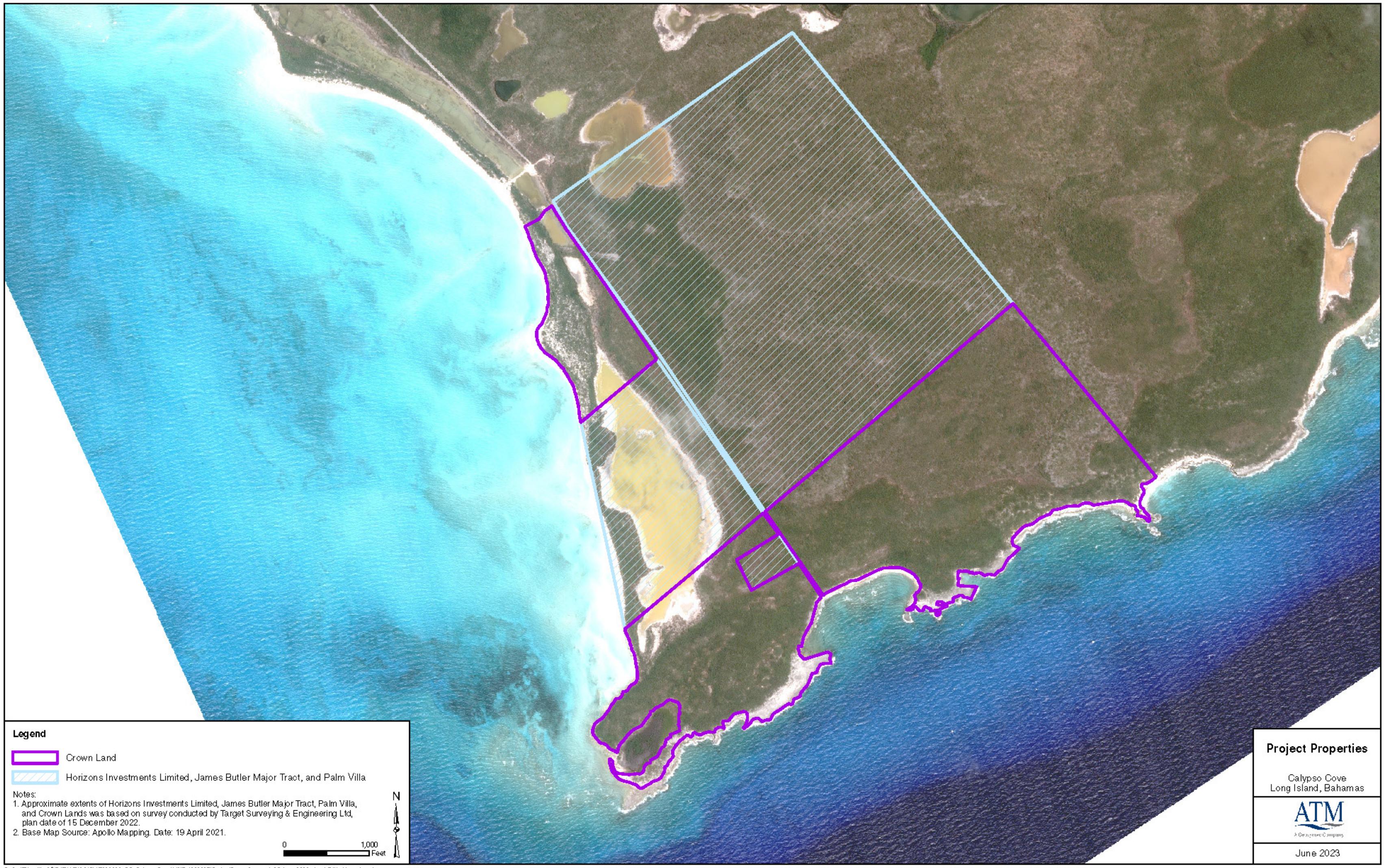


Figure 1-1. Project Properties

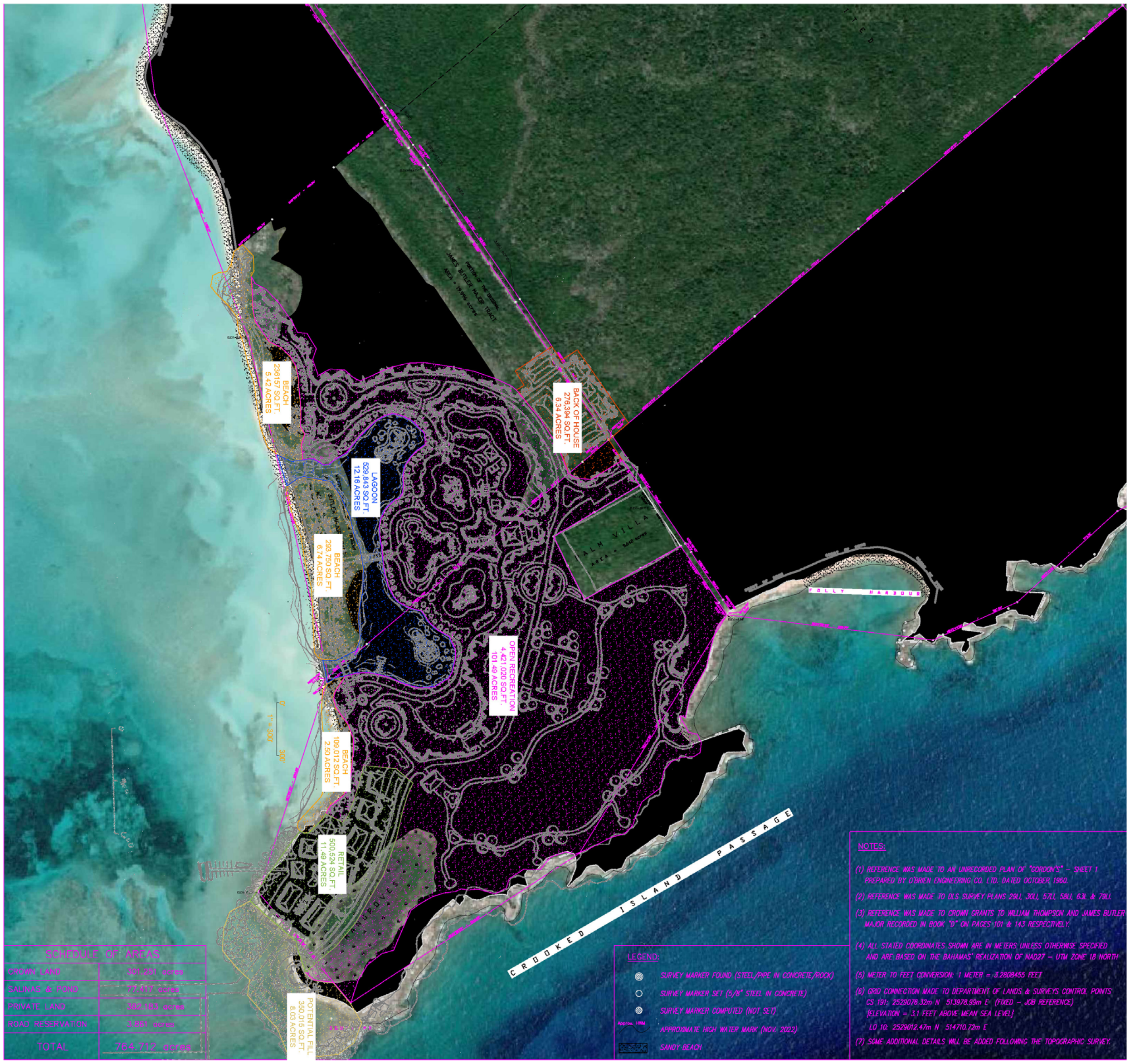


Figure 1-2. Calypso Cove Use Areas

2.0 Project Description

2.1 Conceptual Master Plan

The Developer proposes to transform the currently vacant site into an out-island destination that will be visited by cruise passengers, as shown in the concept plan (Figure 2-1). Due to a limited work force of Long Island residents who reside within commuting distance from the site, housing for some workers is proposed to be constructed as part of the project under Phase 2. Housing will be done as part of the initial project to which would include direct employees and that of concessionaires working on the property. It is envisioned that the developer shall in subsequent stages design and offer a mid-level housing subdivision on its land in order to ensure the employees may be afforded a sense of permanency and commitment to the Project for the mutual benefit of all parties involved. In total, the proposed development will include elements as described in the following sections. Phase 1 of the proposed project also includes construction and operation of a variety of BOH components.

2.1.1 Back of House

The Calypso Cove project will require BOH areas to provide support to the project areas. This will include water and wastewater services, power generation, garbage sorting and collection, recycling storage, fuel storage, maintenance and repair areas, staff housing and kitchens. The BOH will be integrated into the plan for the site at locations that will have access limited to employees only.

Back-of-House

Pump House	Reverse Osmosis (RO) Units
Maintenance Building	Wastewater Treatment Plant (WWTP)
Electrical Building	Potable Water Tank
Sanitation Building	Reuse Water Tank
Power Generator	Incinerator
Diesel Tank	Cell Tower
Gasoline Tank	

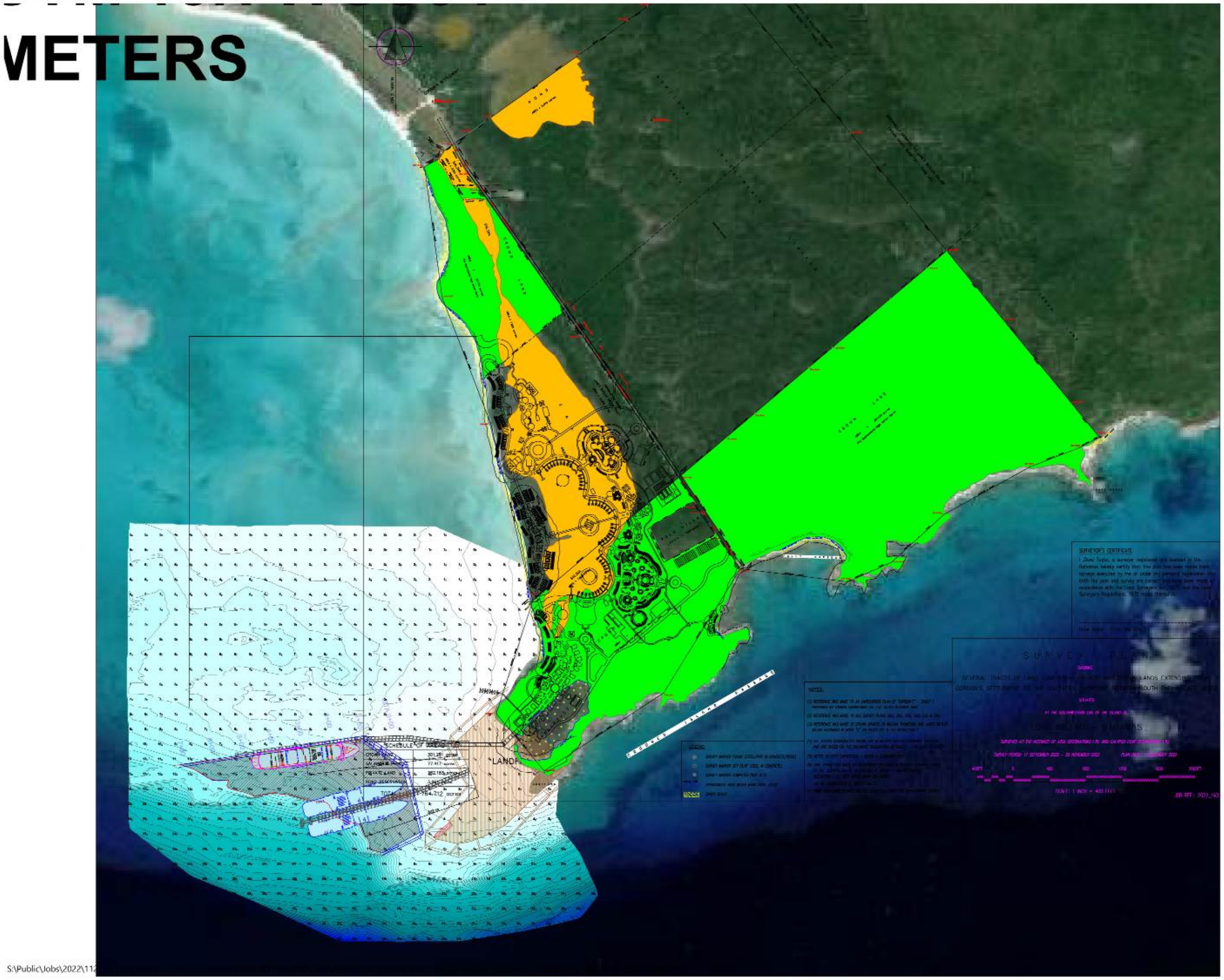


Figure 2-1. Calypso Cove Concept Plan

2.1.2 Cruise Ship Berthing Area

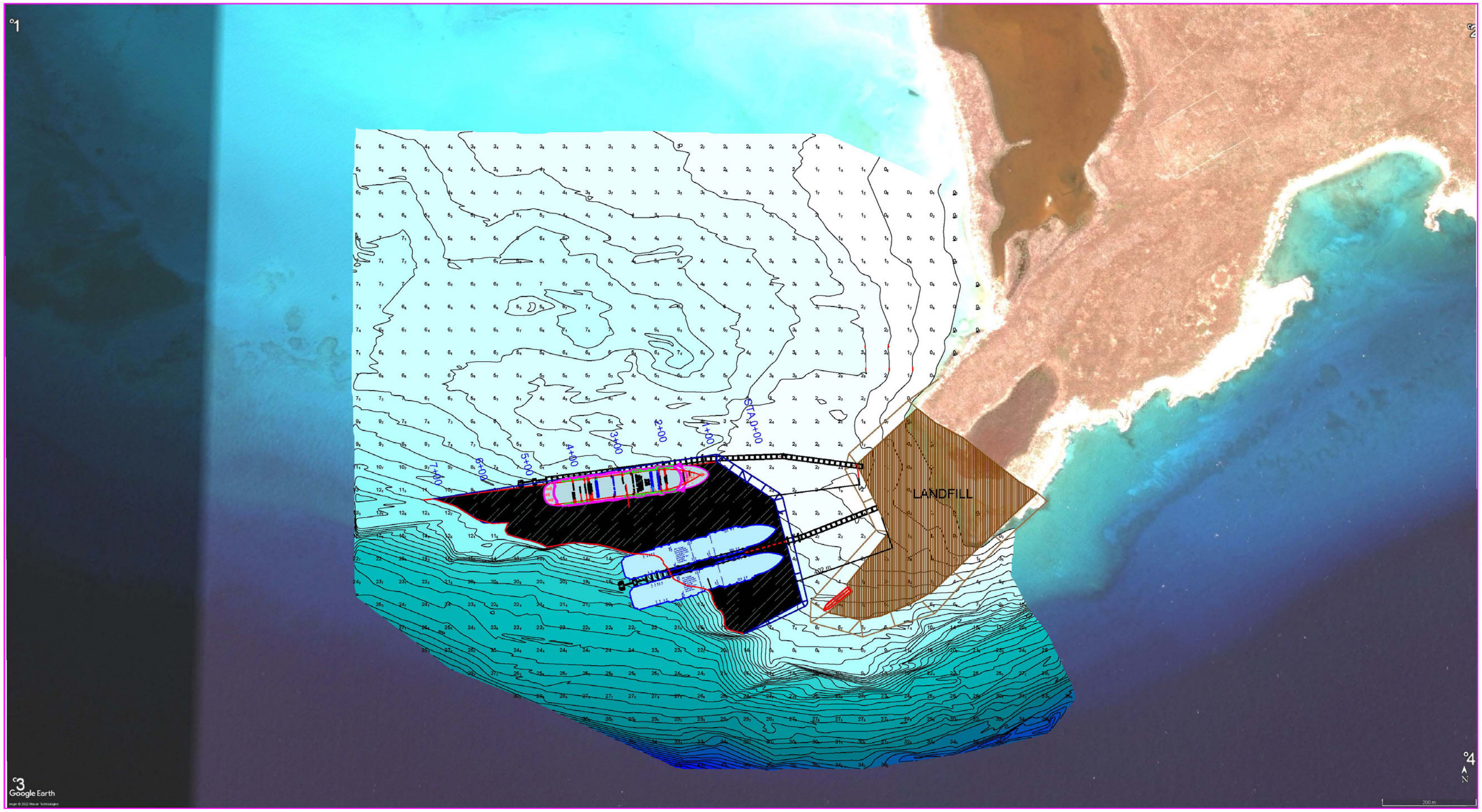
The berthing facility has been designed for a maximum capacity of three passenger cruise ships (Figure 2-2). The ships that are expected to use the slips use bow and stern thrusters and, therefore, require no tugs or pilot services. A Bahamian owned Pilotage company providing exclusive services to land at the port may be established. Under normal conditions, the ships are expected to pull into the berths in a bow-forward direction.

As part of the project, a separate Roll On/Roll Off (RO/RO) pier will be constructed along the western side of the shoreline to provide deliveries of essential equipment and supplies. This pier will operate independently of the large ship berthing area and is shown on the conceptual plan.

The cruise ships that are expected to use the facility have a draft of up to 30 ft and require up to 36 ft of water depth (at lowest low) in sheltered areas protected from large swells. In areas exposed to swell conditions, the vessel requires 45 ft of water depth. Some land filling and an access pier from the filled area will allow the ships to dock with a limited amount of dredging near the stern areas of the vessels. Pier-side cruise ship utilities will include lighting, electrical service, potable water and fuel bunkering connections, mooring arrangements, and embarkation/debarkation structures. Access control to the pier will be incorporated to meet security requirements.

2.1.3 Lagoon with Overwater Bungalows and Marine Recreation Area

A key feature of the proposed project is an approximately 64-acre lagoon, which will be excavated from existing salt ponds and uplands to create a protected area for swimming, snorkeling and water sports. The lagoon may be reduced in size pending future changes to the master plan. Existing material will be removed and mixed with other excavated material for filling and mostly onsite grading. The replacement of existing soils with clean sand will reduce suspension of materials, address existing hypersaline conditions, and improve water clarity, converting the existing hypersaline salt pond into a marine ecosystem. An Environmental Management Plan (EMP) will address best management practices (BMPs) to ensure that construction and use of this area will not adversely affect conditions in the nearshore marine areas immediately to the west.



Long Island, Bahamas - Concept 5.2 w 3rd Berth Options(draft)
4-18-2023
1,000 Meters

Figure 2-2. Ship Berthing Plan

To enhance the water quality in the lagoon and prevent creation of stagnant conditions, two new flushing canals will be constructed in the northwest portion of the lagoon. The flushing canal will be for water flow and non-motorized watercraft (i.e., kayaks, paddleboards), and will not be navigable or intended for motor vessels to enter the lagoon. At present time, the size of the canal is being determined and whether additional flushing enhancements are needed.

2.1.4 Beach Enhancement Areas

The western shore of the project area consists mostly of beach and sand with some patches of isolated seagrass and rubble. The conceptual beach enhancements are based on locally observed conditions and discussions with local residents familiar with the area. To increase the beach usage area, the shoreline will be cleared into the uplands, and new sand will be placed on the upland. No coastal structures are proposed. By using this method, no sand filling of the water areas will be required, invasive non-native *Casuarina* trees will be removed, and potential direct adverse impacts to submerged aquatic vegetation, seagrasses or other benthic habitats will be non-existent or minimal.

2.2 Infrastructure and Utilities

2.2.1 Transportation

The southern tip of Long Island and Calypso Cove is accessible by boat and an existing road that terminates near the northern portion of the project parcel. Staff access and egress from the site will be primarily by roads to neighboring communities.

Most visitors to the site will arrive directly by cruise ship. However, other public visitors will be allowed on the site for paid use. While on the island, the primary mode of transportation for staff and guests will be various modes of motorized transport, and some staff will use utility vehicles. Consistent with the Concept Plan, approximately four to six miles of 8- 24-ft-wide guest and service paths are proposed. These paths will include paving, drainage, and other design details necessary to construct them in accordance with the standards and specifications of the Ministry of Works and Utilities and BMPs. Some standard-sized trucks and utility vehicles will be located on the island in association with the marina and other support facilities. All vehicles will utilize the access road that will run along most of the length of .

2.2.2 Electricity

Calypso Cove will attempt to be completely self sufficient for electrical power. Power will be provided by a series of solar arrays, wind generation, LNG and potentially other renewable energy systems, as well as some diesel generators using fuel stored onsite. Only portions of the site will require electricity, and all distribution wiring will be underground. All systems requiring power will have a redundant generation capacity to assure uninterrupted operation.

2.2.3 Water

Potable water will be produced onsite by an RO water treatment plant. The RO plant will produce potable water of a quality that meets requirements for domestic use. Additionally, water produced by the RO plant will be available for landscaping needs, as necessary, to supplement reuse water from the WWTP.

The RO water treatment facility will include supply wells, pre-treatment and post-treatment systems, membrane cleaning system, RO skids with cartridge filters and pumps, and disposal systems. Brine that is a by-product of the RO system will be discharged into the deep water of the ship channel or potentially into the ships grey-water system.

2.2.4 Wastewater

Wastewater generated onsite will be collected via a central sewer system and pumped to an activated sludge WWTP. The WWTP will be constructed in accordance with standard design and permitting requirements to provide treated water consistent with public access reuse requirements.

2.2.5 Solid Waste

All solid wastes generated both during and after construction will be collected, processed for volume reduction, and disposed of in an appropriate manner. Excess food waste will be incinerated onsite. Landscape clippings will be mulched or landfilled and high-weight, hard-to-handle debris, such as concrete and other construction debris, will be landfilled on island in a permanent solid waste area. Where possible, the remaining waste will be removed from the island and recycled via the ship.

2.2.6 Stormwater Runoff

Stormwater runoff from roads and other impervious surfaces within the site will be handled with standard accepted BMPs. Runoff from these areas will be directed away from the salinas, and handled in a manner that will provide sedimentation and water quality management.

3.0 Area Boundaries and Alternatives

3.1 Site Location

The proposed Calypso Cove project is located at the southern tip of Long Island, The Bahamas. The site is approximately 220 miles southeast of New Providence and 20 miles south of Clarence Town. Figure 3-1 shows the location of Calypso Cove in relation to the Islands of the Bahamas.

3.2 Site Boundaries

The site boundaries of the proposed project development are shown in Figure 3-2 and include 301.3 acres of Crown Land, 77.4 acres of salinas and ponds, 382.2 acres of private land and 3.8 acres of road reservation, for a total of 764.7 acres.

3.3 Areas of Influence

The Calypso Cove project has several potential areas of influence, which include the following:

- Direct and indirect impacts to the salina and ponds
- The mixed mangroves located near the southern tip
- The submerged lands where the ship berthing terminal will be located
- Direct impacts to uplands on the subject parcel and adjacent crown lands
- Secondary impacts to adjacent vegetative tracts and western near-shore waters

Upland onsite impacts include land clearing associated with the development, roadways, island amenities, infrastructure, beaches, and the cruise ship berthing area. Marine impact areas include hardbottom, low-relief reef and seagrass communities impacted by the dredging associated with the cruise ship area; and potential secondary impacts of the development on adjacent marine resources. This EIA document lists all proposed project components and details their potential environmental impacts.

3.3.1 Natural Parks, Protected Areas, and Marine Reserves

There are no formally established natural parks, protected areas, or marine reserves currently located on or immediately adjacent to Calypso Cove.

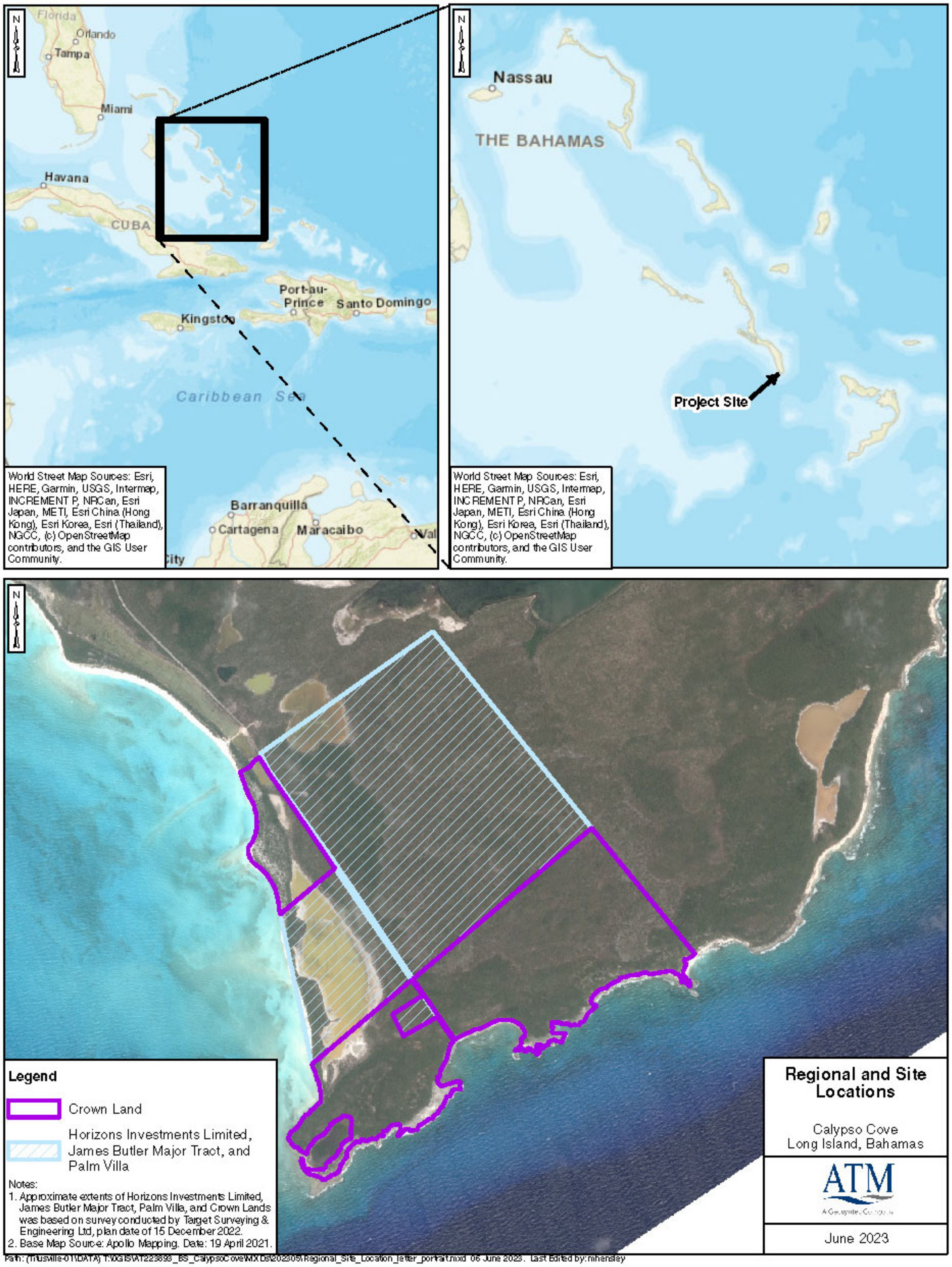


Figure 3-1. Regional and Site Locations

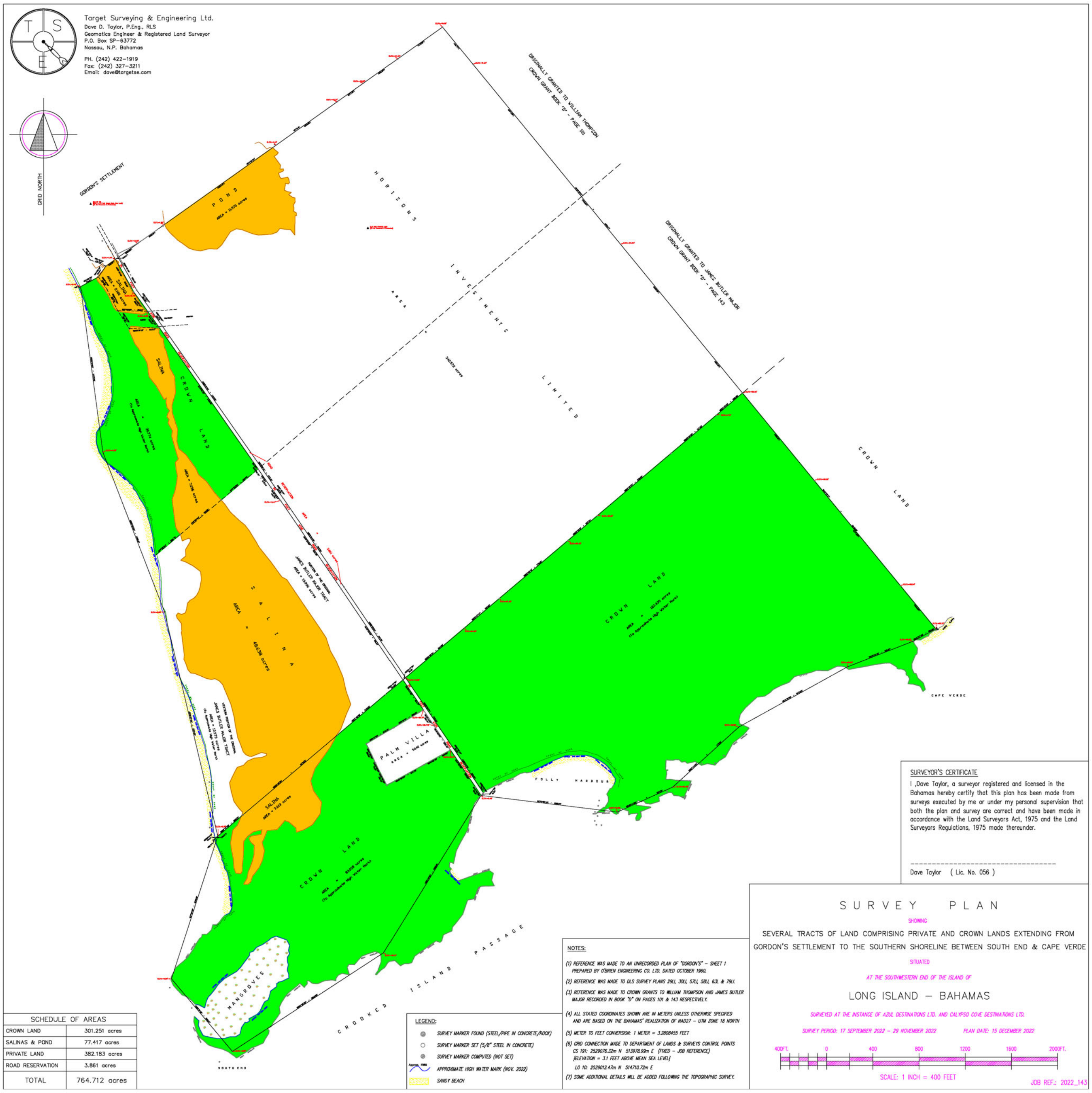


Figure 3-2. Calypso Cove Site Boundaries

3.3.2 Adjacent Communities

Calypso Cove is located in a remote area of Long Island with very few inhabitants. The closest population center, Gordon's Settlement, with fewer than 4 full-time residents, is less than one mile from the site. Clarence Town is located approximately 20 miles north and is one of the larger settlements on Long Island.

3.4 Alternatives Analysis

3.4.1 Ship Berthing Area

Due to the predominant currents, existing natural water depths and presence of sensitive habitat areas, the somewhat protected area at the southwest tip of Long Island was chosen as the location of the ship berthing area. The area allowed for maximum natural protection from the north and open ocean, with the least impacts to adjacent marine habitats and shallow areas to reduce the dredging footprint. It also allowed for the shortest distance to deeper water, thereby minimizing the amount of dredging and benthic habitat impacts that would be required.

The eastern shore was not considered due to the open ocean swells, and the western shore was rejected due to limited depths and a need for extensive dredging. Anchoring offshore and tendering passengers to the Island was also rejected due to safety concerns and the limited anchor areas available that would not impact environmentally valuable offshore habitats.

4.0 Baseline Description of the Development Site

4.1 Geography and Topography

4.1.1 Physical Geography

Long Island is located 30 miles south of Cat Island and 18 miles east of the lower Exuma Island chain. The Calypso Cove site is at the extreme southern tip of Long Island and is surrounded on the east, south and west sides by open water. Crooked Island Passage is a deep water navigational passage between Crooked Island and Long Island.

4.1.2 Upland Topography

A site topographic map is provided in Figures 4-1. The site varies topographically across the tip, but can mostly be characterized as relatively flat, with some areas of higher elevation, mostly near the central portion of the property. The highest point is in the center area of the site, with a recorded elevation of approximately 65 ft. The eastern coastline has higher bluffs, contrasting with the beaches along the western shore.

4.1.3 Offshore Bathymetry

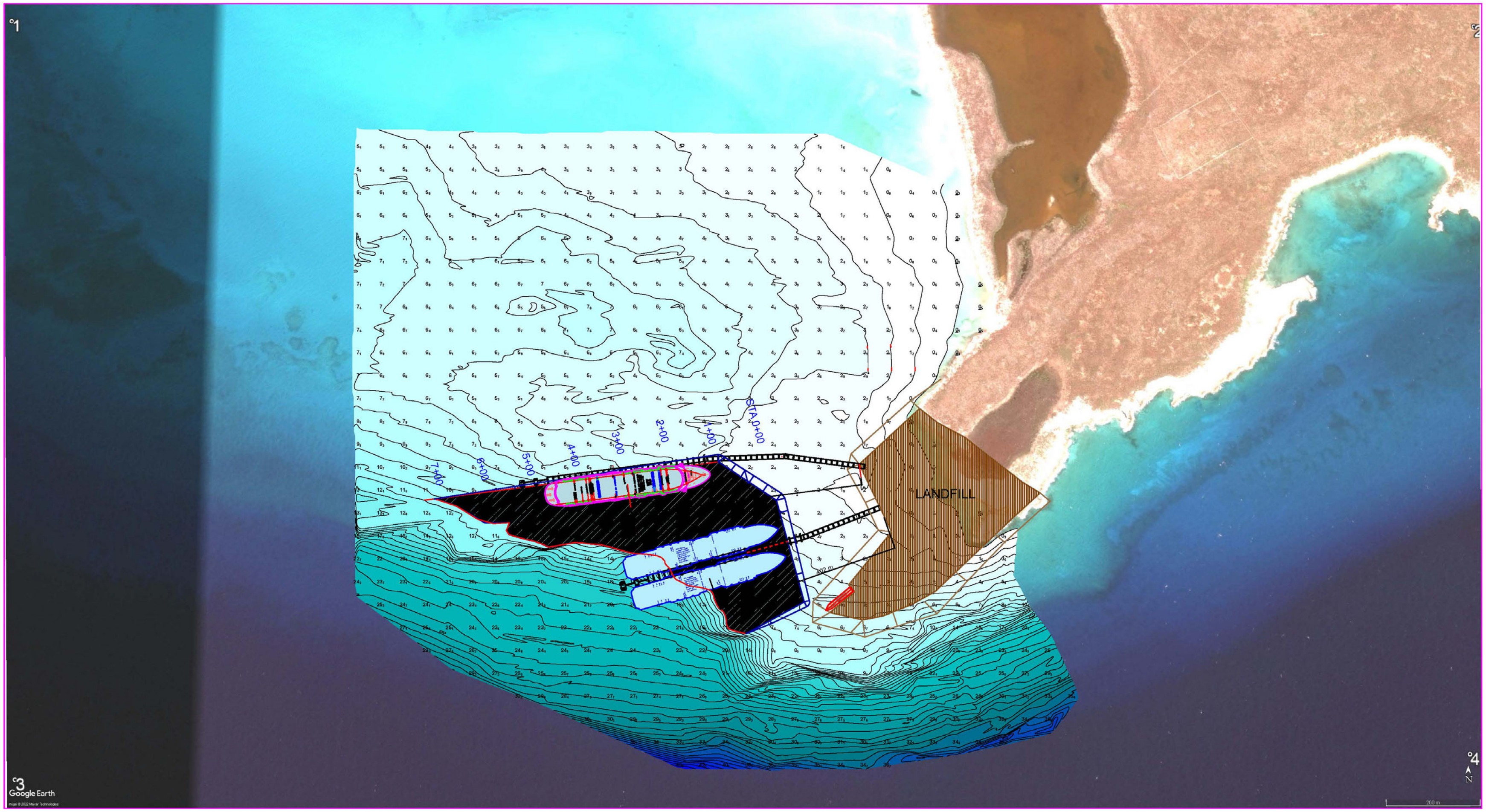
Regional bathymetry is presented in Figure 4-2. Nearshore bathymetry along the west is relatively shallow across the bank, whereas the east shore quickly drops off to more than 100 ft within a few hundred feet from shore. The proposed berthing area ranges from 10 ft to 60 ft deep before reaching deeper waters of Crooked Island Passage.

4.2 Climate and Meteorology

4.2.1 Temperature

Historical meteorology for Long Island is based on data collected at the Nassau Airport on New Providence Island, which is the most comprehensive information for The Bahamas Islands. Additional meteorology details specific to Long Island can be found at *Simulated historical climate & weather data for Long Island - meteoblue*. Table 4-1 presents meteorological statistics for temperature, precipitation, wind, barometric pressure, relative humidity, wind and sunshine.

Figure 4-1. Calypso Cove Topography



Long Island, Bahamas - Concept 5.2 w 3rd Berth Options(draft)
4-18-2023
1,000 Meters

Figure 4-2. Calypso Cove Regional Bathymetry

Table 4-1. Nassau Airport Meteorological Statistics

		Month											
Statistics	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature													
Monthly Mean***	°F	70.7	70.9	72.6	74.9	77.8	80.6	82.1	82.5	81.5	79.1	75.2	72.1
Mean Daily Maximum	°F	77.3	77.5	79.7	81.8	84.6	87.3	89.1	89.3	88.4	85.4	81.8	78.7
Mean Daily Minimum	°F	62.1	62.5	63.8	66.2	69.8	73.3	74.7	74.8	74.4	71.9	68.0	63.8
Hourly Means													
07h	°F	65.9	66.2	68.1	71.2	75.9	79.4	80.6	80.2	78.5	75.7	71.4	67.5
13h	°F	75.2	75.4	77.5	79.5	82.1	84.6	86.6	86.7	85.6	83.2	79.8	76.6
Highest Maximum	°F	86.4	88.7	87.8	91.2	92.3	93.2	93.4	95.0	93.2	91.8	90.0	86.7
Lowest Minimum	°F	41.4	45.8	44.6	48.6	55.5	59.0	64.2	64.4	59.5	56.0*	51.0*	41.5
Mean Dew Point	°F	62.6	62.6	63.5	64.9	69.6	73.5	74.6	75.0	74.7	71.8	67.6	64.0
Rainfall													
Rainfall Monthly Total	Inches	1.86	1.59	1.57	2.12	4.58	9.17	6.21	8.50	6.75	6.91	2.23	2.04
Maximum Rainfall/Day	Inches	4.62	3.47	3.48	11.23	3.48	6.55	4.08	6.23	5.31	8.07	2.68	4.64
Number of Days		8	6	6	5	10	15	17	18	17	16	9	8
Other Statistics													
Pressure	mmHg	19.6	19.3	20.2	21.1	24.5	28.1	29.0	29.5	29.2	26.4	23.1	20.6
Mean R. H.	%	78	78	76	74	77	79	77	79	81	80	78	78
Mean Wind Speeds	mph	8.0	8.6	8.9	8.3	7.9	7.2	7.1	6.9	6.2	7.4	8.1	7.8
Sunshine Mean Daily	Hours	7.1	7.6	8.3	9.2	8.7	7.7	8.8	8.6	7.1	7.2	7.4	6.9

*Occurred outside the 30-year means 1961-1990.
**Highest/lowest temperature on record: 95.4°F High; 41.4°F Low.
***Period of record: 1874 to 1987.

The monthly mean temperature ranges from 70.7 degrees Fahrenheit (°F) to 82.5°F. The average daily minimums range from 62.1°F to 74.8°F, while the maximums range from 77.3°F to 89.3°F. The data reflect the temperate climate of the Bahamas, with a low degree of fluctuation in air temperature.

4.2.2 Precipitation

Table 4-1 includes monthly rainfall statistics recorded at the Nassau Airport. The data indicate that the highest rainfall occurs during the summer months. Of the total average rainfall per year (53.53 inches), more than half (38 inches) falls from June through October.

4.2.3 Winds

Table 4-1 presents the average monthly wind speeds, and Figure 4-3 presents monthly average wind roses for the Nassau airport. The mean wind speeds do not appear to vary significantly on a monthly basis. The average monthly wind speeds range from 6.2 miles per hour (mph) in September to 8.9 mph in March (Table 4-1). The highest average winds are observed generally during the fall and winter months (Table 4-1).

The prevailing winds at the site generally occur from the easterly trade winds. The wind directions are predominantly from the east. There is a slight variation to the east-northeast in the fall and winter months, and a more significant variation during the summer months, when more winds are from the southeast (Figure 4-3). In the summer months, there are winds recorded from the west.

4.2.4 Storms

Long Island is located within the Atlantic Tropical Cyclone basin. This basin includes much of the North Atlantic, Caribbean Sea and the Gulf of Mexico. On average, six to eight tropical storms per year form within this basin. The formation of these storms, and possible intensification into mature hurricanes, takes place over warm tropical and subtropical waters. Eventual dissipation or modification, averaging seven to eight days later, typically occurs over the colder waters of the North Atlantic, or when the storms move over land and away from the sustaining marine environment.

Due to the destructive nature of these storms, landfall can result in significant damage to upland development and facilities from storm surge, waves and wind. Hurricane Rita in 2005 is a good example of this. Figure 4-4 lists the number of tropical storms and hurricanes that passed within 60 miles of the project area over the past 20 seasons (from 2003 through 2023), as reported by the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center.

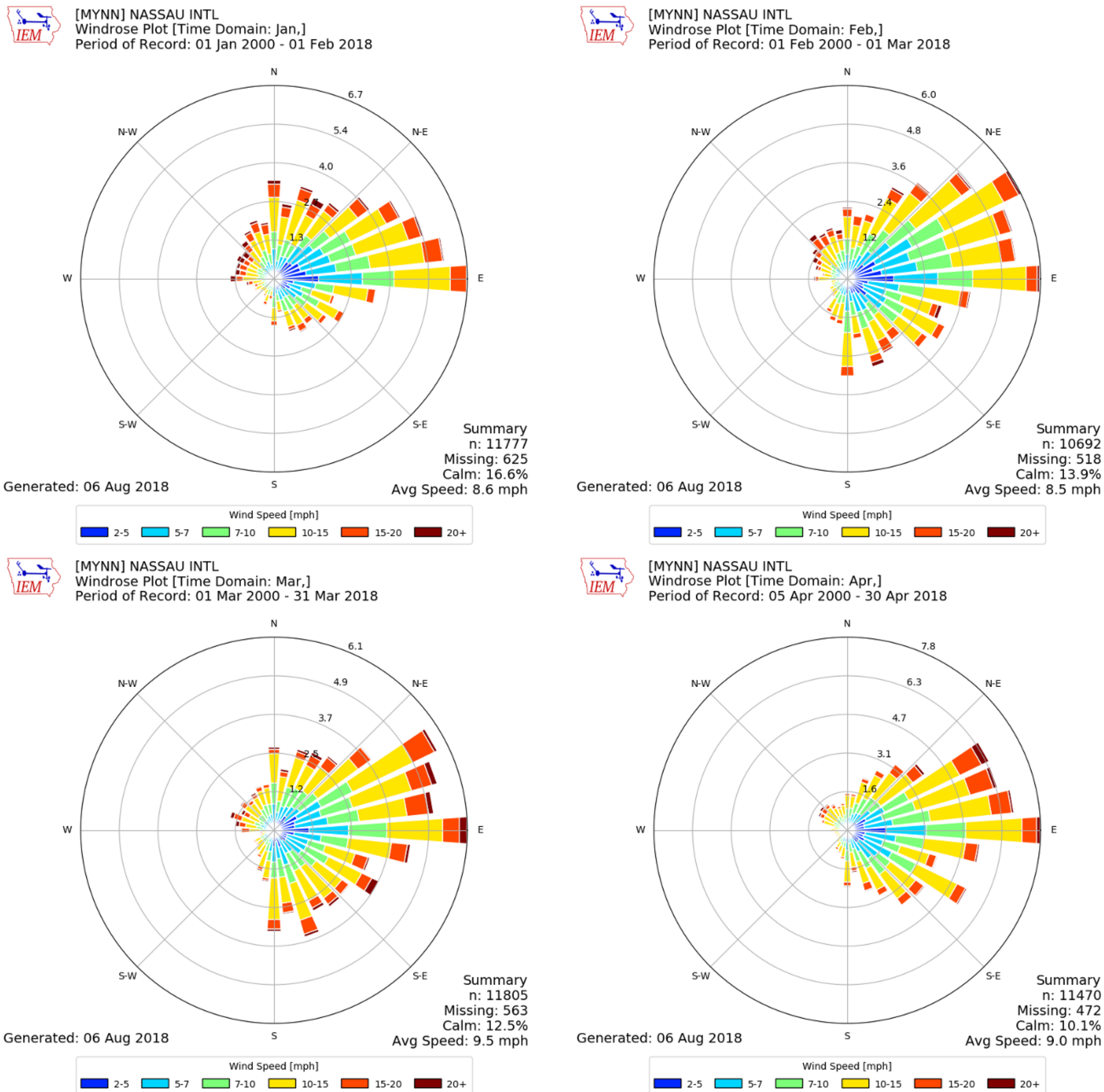
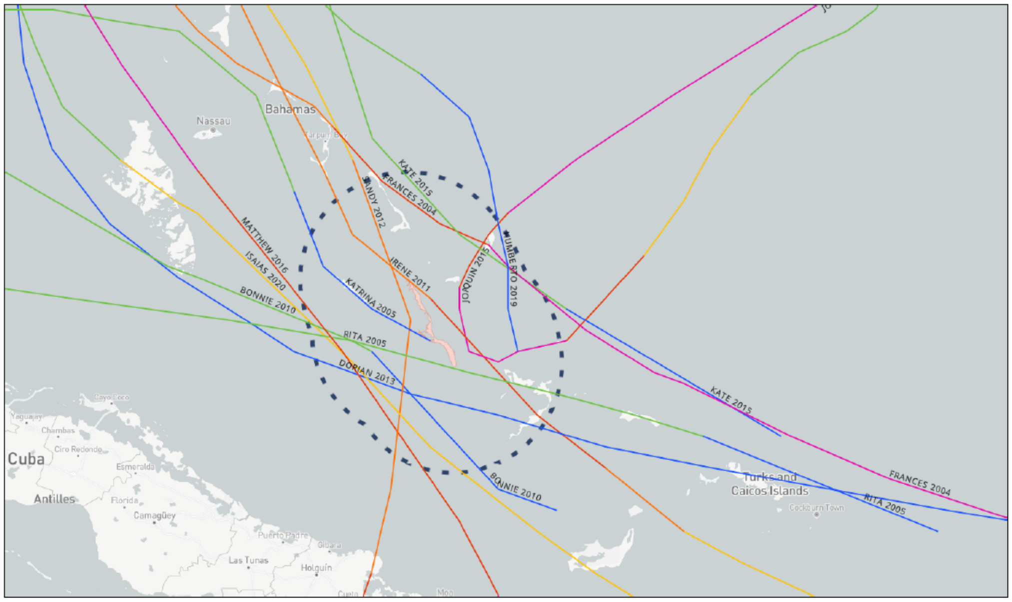


Figure 4-3. Monthly Wind Roses – Nassau International Airport



Location: Long Island, The Bahamas

Categories: H5, H4, H3, H2, H1, TS, TD, ET
Months: ALL
Years: 2023, 2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006, 2005, 2004, 2003
El Niño-Southern Oscillation (ENSO): ALL
Minimum Pressure (mb) below: 1030

Buffer Distance: 60
Buffer Unit: Nautical Miles

STORM NAME	DATE RANGE	MAX WIND SPEED	MIN PRESSURE	MAX CATEGORY
ISAIAS 2020	Jul 28, 2020 to Aug 05, 2020	80	986	H1
HUMBERTO 2019	Sep 12, 2019 to Sep 20, 2019	110	950	H3
MATTHEW 2016	Sep 28, 2016 to Oct 10, 2016	145	934	H5
KATE 2015	Nov 08, 2015 to Nov 13, 2015	75	980	H1
JOAQUIN 2015	Sep 26, 2015 to Oct 15, 2015	135	931	H4
DORIAN 2013	Jul 22, 2013 to Aug 04, 2013	50	1002	TS
SANDY 2012	Oct 21, 2012 to Oct 31, 2012	100	940	H3
IRENE 2011	Aug 21, 2011 to Aug 30, 2011	105	942	H3
BONNIE 2010	Jul 22, 2010 to Jul 25, 2010	40	1005	TS
RITA 2005	Sep 18, 2005 to Sep 26, 2005	155	895	H5
KATRINA 2005	Aug 23, 2005 to Aug 31, 2005	150	902	H5
FRANCES 2004	Aug 25, 2004 to Sep 10, 2004	125	935	H4

Figure 4-4. Storm Tracks for All Known Hurricanes that Passed within 100 Nautical Miles of Calypso Cove between 2004 and 2020 (Source: NOAA, 2023)

Recent storms of record are Hurricanes Isaias, Humberto, Mathew and Joaquin, which were all Category 3 or stronger. Storm surge in this remote area is difficult to measure and little information is available, however, the passage of Hurricane Andrew in 1992 resulted in 170 mph winds and a 23-ft storm surge in parts of Eleuthera.

4.3 Geology

4.3.1 Regional Geology

As is the case of islands throughout the Bahamas, Long Island is the result of shallow water deposited carbonate sediments building on the stable, but aseismically subsiding Great Bahama Bank. The shallow strata at Long Island are anticipated to correlate with the Pliocene/Pleistocene age Lucayan Formation, which is composed of a laterally discontinuous sequence of fossil coral and carbonate deposits (Ewbank Preece Limited, 1996). The carbonate/evaporitic sequences of the Bahamas are geologically young and have generally not been deformed, folded or faulted through regional tectonic forces; however, relatively small-scale growth faults are commonly present in outcrop exposures such as the sea cliffs at Clifton, New Providence.

4.3.1.1 Seismology

Inasmuch as the Great Bahama Bank is located on the North American Plate and more than 700 miles from the North American-Caribbean Plate boundary, it is usually thought of as being aseismic. The closest potential large-scale seismic source is most likely the North Hispaniola fault, located offshore of northern Dominican Republic, some 750 miles southeast of New Providence (Dixon et al., 1998) and the Septentrional fault, which is exposed within the Cordillera Septentrional of Hispaniola (Prentice et al., 1998). The Septentrional fault zone (SFZ) continues to the west of Hispaniola as a transform boundary composed of a complex of left-lateral faults extending across the Caribbean Sea and into Central America. To the east of Hispaniola, the plate boundary is located within a transition zone between a subduction zone and a transform zone. The primary geologic structures associated with the transform zone to the east of Hispaniola and offshore of northern Puerto Rico are the North and South Puerto Rico Slope faults (Prentice et al., 1998).

Paleoseismology studies conducted by the U.S. Geological Survey (USGS) and cooperating universities indicated that the most recent earthquake that ruptured ground surface along the SFZ in the northern Dominican Republic occurred about 800 years ago. These studies were based on identifying and analyzing paleoliquefaction structures in shallow Holocene age alluvial deposits in the western and eastern Cibao Valley. In general, an earthquake of magnitude 5.5 to 6.0 is considered to be the threshold at which soils will undergo liquefaction. Under soil liquefaction conditions, soils become quick and lose their load-bearing capacity.

Analysis of global positioning system (GPS) measurements collected during 1986, 1994, and 1995 at various stations in the Dominican Republic, Puerto Rico, Cuba and Grand Turk Island provided an estimate of the velocity of the Caribbean Plate relative to the North American Plate. The data analyses indicated a relative motion of the Caribbean Plate toward the east at 21 ±1 millimeter per year (mm/yr). The data were combined with elastic strain models to provide estimates of slip rates for major left lateral strike-slip faults on Hispaniola and environs. Slip along the North Hispaniola fault (offshore of the north coast of Hispaniola) was calculated to be 4 ±3 mm/yr and 8 ±3 mm/yr for the Septentrional fault, located onshore in northern Dominican Republic (Dixon et al., 1998). The authors concluded that the relatively high plate motion and the slip rates on the major left lateral strike-slip faults, strain accumulation, and historic seismicity may indicate an increased risk of moderate or larger earthquake occurrence in the northern Caribbean basin than prior estimates had predicted (Dixon et al., 1998). These data notwithstanding, seismic concerns relative to the Bahama Archipelago in general, and the project site specifically, are minimal.

More recently, a small seismic event was reported in the area on November 8, 2022, where some slight shaking was observed in the Mayaguana District of the Bahamas. The event was disregarded and considered likely not a quake.

4.3.1.2 Geomorphology

Long Island is located proximal to a major submarine canyon (Crooked Island Passage) that is incised into the Great Bahama Bank. The dropoff or wall of the bank is situated only about one to two miles south and east of the project site. Maximum water depth within the Crooked Island Passage is approximately 7,000 ft.

The dominant geomorphology of Long Island is karst landscape, typified by solutional features such as erosional vugs, caves and shafts, sink holes and dolines, and solutionally enlarged joints and fractures within the surface and subsurface limestone country rock. The stability of the shoreline is and will continue to be a function of eustatic sea level rise, carbonate sediment supply, and asymmetrical subsidence of the larger carbonate platform.

Long Island and the surrounding cays are the emergent portion of the larger Great Bahama Bank carbonate platform. The interior of the larger carbonate platform is shallow and dissected by fringe reef, patch reef, intertidal shoals, and emergent island landforms. These topographic high, ridge features were formed by the solidification and partial solidification of carbonate sand dunes during the Pleistocene geologic time period of lower sea level. The carbonate sand was provided by the original and persistent carbonate reef system that has developed into the Great Bahama Bank carbonate platform.

4.3.1.3 Soils

Soils on Long Island are dominantly composed of windblown and hydraulically deposited calcareous sand, silt and clay. These soils range from lagoonal, intertidal, supratidal and upland deposits with moderate to low organic content. The upland soil is a very thin veneer over the underlying calcareous limestone. The upland soil has undergone only minor soil genesis and generally is not considered as significant. The humus content of the upland soil is minimal, and the shallow soil horizons lack significant trace elements and basic nutritional compounds (nitrogen, phosphorus and potassium) that would sustain traditional agriculture without considerable anthropogenic assistance.

4.3.1.4 Caves and Blue Holes

No caves, solutions shafts of notable size, or blue holes were observed during the landside assessment, nor have any been reported by individuals familiar with the site. However Long Island is known to be famous for caves, and although a detailed land assessment was not made, it is possible that some caves or solution shafts do exist on the project site.

4.3.2 Site Geology

The carbonate rock sequences (limestones) expected to be present within the project site stratigraphy include fossilized coral and bryozoan reefs containing a matrix of reef detritus (reef deposits), lithified oolitic sequences (some deposited under tidal flat conditions and others as eolian dune/ridge deposits), and calcite-cemented shell hash. In addition, it is likely that evaporitic sequences and/or lagoon deposits are present within the stratigraphy.

4.3.3 Hydrogeology and Water Resources

Hydrogeologic resources are not estimated to be significant on Long Island. A thorough assessment of the hydrogeologic conditions will be developed as part of the civil engineering infrastructure detailed design. For purposes of the proposed development, it is unlikely that freshwater resources are of a magnitude and degree of reliability that they could be adequate to serve the proposed development. An RO plant will be constructed on the island to provide potable water for the development.

4.4 Surface Waters

Long Island is surrounded by the Crooked Island Passage to the south, open ocean to the east and open waters to the west. Nearshore waters are shallow on the west side and very deep waters are on the south and east. Depths increase considerably within a few miles of the coast to the east, dropping several thousand feet in the Crooked Island Passage. These bathymetric features and local meteorology are the primary factors influencing water levels and currents and are the reason the Developer selected this location for its cruise ship operations.

Ecological investigations of the project site indicate that the three shallow salinas on the western portion of the site are the only existing surface water on the site. These features are described in greater detail in Section 4.7.1.2.

4.4.1 Water Levels and Circulation

A complete detailed Coastal Engineering Study Report (Oceanside Solutions, 2022) was completed for the project site in July 2022 and is included as Appendix A. The tides at Long Island are semi-diurnal (12.42-hour period), with a mean range of 3.2 ft. Ocean currents around the Bahamian Islands are predominantly northwesterly, with the Antilles current flowing northward east of the Antilles and joins the Florida Current past the outer Bahamas.

4.4.2 Water Quality

The Bahamas is known for its extremely clear, nutrient-deficient, oligotrophic water. Overall water quality conditions in the waters surrounding Long Island are good, with no areas showing any significant degradation. Upland impacts to water quality are also presently minimal due to the island's undeveloped nature.

4.5 Shoreline and Coastal Processes

4.5.1 Wave Climate

The prevailing wave conditions near Long Island are representative of the prevailing wind direction and magnitude. The project area is also impacted by waves resulting from tropical storms, hurricanes, frontal systems, and other weather events with elevated wind conditions. As described in Section 4.2.3, the prevailing winds are from the east, and are influenced by the tradewinds. Generally, the tradewinds vary seasonably from the east-northeast to southeast directions.

The offshore wave statistical results show that the predominant wind waves are from E, ENE and ESE directions, while the predominant swell waves are from E, ENE and NE directions. Both wind waves and swell waves are much higher during the months from October to April as compared to the months from May to September.

The wave propagation modeling results show that offshore wave heights decrease when arriving at the project site. Waves at deeper water to the South are higher due to greater exposure to the open sea, while waves at shallower water to the West of the project site are lower. Wave roses and statistics at four different locations in the project vicinity are presented in the Coastal Engineering Study Report (Appendix A).

4.5.2 Shoreline Distribution

The shoreline features of Long Island are dominated by rock along the eastern shore and sandy beach along the western shore (see Section 4.6.2 for detailed descriptions). The rocky portions of the shoreline generally have approximately 4 to 6 ft of relief above mean high water (MHW). In the water adjacent to the rocky shoreline, there are areas of mixed sand, rock, coral and seagrasses.

4.5.3 Existing Coastal Processes

There is limited knowledge of the coastal processes for Long Island. Baseline information is based mostly on historical aerial photographs and verbal conversations with local residents familiar with the area. The beach areas appear to have an inherently stable sandy shoreline. The eastern shoreline has minimal erosional rock and is considered very stable.

4.6 Marine Ecology

Analysis of marine conditions at the site included both desktop and field investigations. The first step in impact assessment involved a desktop assessment completed in April 2022 by Oceanside Solutions, and relied primarily on remote sensing to create a preliminary benthic habitat map which identified the benthic communities that would be directly impacted by the proposed project (Oceanside Solutions, 2022). Follow-up ground-truthing was performed by senior scientists from ATM to refine benthic community maps and perform qualitative evaluations within the areas of potential Direct, Indirect and Secondary project-related influences. This process allowed for development of a selected site plan based on avoidance and minimization of impacts to the most sensitive and/or irreplaceable marine resources.

4.6.1 Data Acquisition and Methods

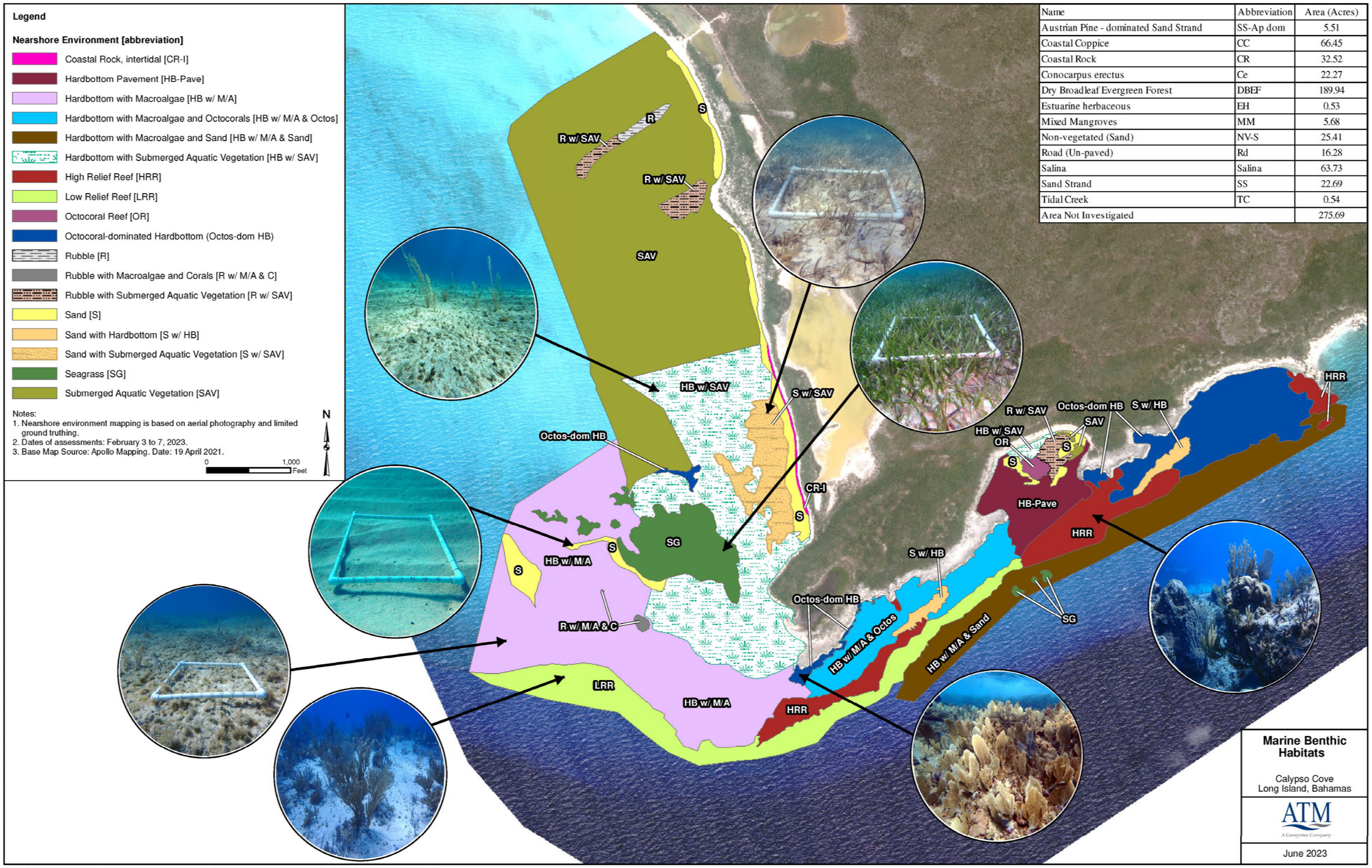
Scientists from ATM conducted cursory reconnaissance of the marine areas in the vicinity of the proposed project in December 2022. ATM performed more detailed investigations and mapping surveys of marine habitats on the west and south sides of the project from February 3 through 7, 2023. High-resolution aerial photographs and the results of the remote sensing mapping effort served as the bases for this marine investigation.

Direct observations of benthic conditions were conducted by snorkeling and using an aquascope in shallow waters and using a hookah diving system and diver tows in marine areas on the east, south, and west sides of the project site. Habitat boundaries and locations of notable features were recorded using a handheld Garmin GPS unit. Benthic habitats were described by assigning general habitat classifications, identifying dominant submerged aquatic vegetation (SAV) and hardbottom and coral reef biota, and noting general locations of dominant and ecologically significant species within the survey areas. Additional descriptive data included general rugosity and relief features of hardbottom and reef habitats and visual assessments of the health/condition of coral reef biota. Representative photographs were taken and are included in the narrative descriptions for each of the benthic community types. Marine scientists reviewed these data and documentation to develop a marine benthic habitat classification system and marine species lists.

Figure 4-5 presents the marine benthic habitat map extending from the shore to approximately 1,500 ft from shore. As with any environmental mapping project, transition zones and small areas with varying conditions likely occur within each mapped community. Boundaries of the assessment areas include all areas that are expected to incur Direct Impacts and nearby areas that have the potential to be affected by Secondary and/or Indirect Impacts. Sensitive resources are likely to exist outside the boundaries of the assessment area.

A list of dominant stony corals, octocorals, SAV, and other marine life observed within the survey areas is included in Appendix B. The marine species list is not a comprehensive list of marine benthic and fish species that are potentially present in these habitats, but includes all species that were observed and identified during the onsite investigations and/or subsequent analysis of underwater photographs. The comparative abundance of each species observed during the investigation is noted on the species list, even though the investigation did not include collection of quantitative data of marine species..

It is notable that data regarding the condition of a reef within the project areas was collected in October 2017 as part of the Atlantic and Gulf Rapid Reef Assessment (AGRRA), site for Long Island - South Point, at which time the reef health was rated as a 3. Data regarding this site and others in the vicinity of Long Island are accessible at https://www.arcgis.com/apps/dashboards



Name	Abbreviation	Area (Acres)
Austrian Pine - dominated Sand Strand	SS-Ap dom	5.51
Coastal Coppice	CC	66.45
Coastal Rock	CR	32.52
Conocarpus erectus	Ce	22.27
Dry Broadleaf Evergreen Forest	DBEF	189.94
Estuarine herbaceous	EH	0.53
Mixed Mangroves	MM	5.68
Non-vegetated (Sand)	NV-S	25.41
Road (Un-paved)	Rd	16.28
Salina	Salina	63.73
Sand Strand	SS	22.69
Tidal Creek	TC	0.54
Area Not Investigated		275.69

Path: (Titusville-01\DATA) T:\0GIS\AT223893_BS_CalypsoCove\MXDs\202306\Nearshore_Environment_202306_photos.mxd 06 June 2023. Last Edited by: mhensley

Figure 4-5. Marine Benthic Habitats

Each marine habitat was assigned a qualitative rating, which is presented hereafter. This rating was based on best professional judgement considering factors such as biodiversity, location-appropriate floral and faunal assemblages, the presence, absence and/or abundance of notable (e.g., endangered, endemic etc.) floral and/or faunal species, the extent to which natural conditions appeared to be intact, and the extent to which the area appeared to have been subjected to damage as a result of human and/or natural processes. Hurricane Joaquin inflicted widespread damage when its eye crossed southern Long Island as a Category 4 storm during early October 2015.

Four qualitative rating categories were used based on the following descriptions.

Excellent: Natural floral and faunal communities are intact; have little or no adverse impacts from non-native species; possess primarily natural conditions; and are generally free of adverse human-related (e.g., debris, previous construction) and/or natural (e.g., hurricane) impacts. Species designated as Endangered, Endemic and/or Protected appear to be present in sustainable populations.

Good: Natural floral and faunal communities are present, but communities are not meeting optimal conditions due to adverse impacts from human-related or natural causes. Species designated as Endangered, Endemic and/or Protected may be present, but long-term population sustainability does not appear to be certain.

Fair: Natural floral and faunal communities are substantially impaired as a result of human-related and/or natural causes. Species designated as Endangered, Endemic and/or Protected are absent or minimally present, and their long-term population sustainability appears to be tenuous.

Poor: Native floral and faunal communities are absent or minimally present due to previous human-related and/or natural impacts. Species designated as Endangered, Endemic and/or Protected are either not present or do not appear to be present in sustainable populations.

4.6.2 Description of the Existing Marine Environment

Eighteen benthic community types were mapped as being present within the assessment area. Refer to the accompanying figures for exact locations:

Coastal Rock	Octocoral Reef
Hardbottom Pavement	Rubble
Hardbottom with Macroalgae	Rubble with Macroalgae and Corals
Hardbottom with Macro-Algae and Octocorals	Rubble with Submerged Aquatic Vegetation
Hardbottom with Macroalgae and Sand	Sand
Octocoral-Dominated Hardbottom	Sand with Hardbottom
Hardbottom with Submerged Aquatic Vegetation	Sand with Submerged Aquatic Vegetation
High-Relief Reef	Seagrass
Low-Relief Reef	Submerged Aquatic Vegetation

The following sub-sections provide descriptions, underwater photos taken of representative conditions, and the qualitative rating within each of these 18 benthic communities.

<u>Coastal Rock</u>

This mapping unit consists of rock substrate at and near the elevation of MHW. This community can be considered a landside community at low tide, so it is also discussed in the Landside Communities, Section 4.7. However, because it also includes habitat for aquatic and littoral species, it is also described in this section.

Two types of Coastal Rock communities were found to be present within the assessment area. In areas at the southern tip of the island and along the southeast exposure (Photo 4-1), the coastal rock feature is a wide and steep corridor that is mostly devoid of landside or marine plants and animals. However, a populations of knobbed periwinkles (*Tectarius muricatus*), nerites (*Nerita* spp.) and chitons (*Acanthopleura granulata*) were present in the intertidal zone.

Along the western face of the site, where sea conditions are typically calmer than the southeast exposure, the coastal rock feature is comparatively narrow, is more gently sloped, and is primarily in the intertidal zone. During high tide, this feature may be entirely submerged. Photo 4-2 is representative of this type of coastal rock.

Photo 4-1. Typical Coastal Rock Community on the Southeast Side of the Assessment Area

Photo 4-2. Typical Coastal Rock Community on the West Side of the Assessment Area

Much of the coastal rock is frequently above MHW, so it does not provide habitat for corals or other notable marine life. Although it rated in Good condition, its ecological values are minimal, due primarily to a lack of biodiversity. However, this community does provide extraordinary functional value for resiliency to sea level rise.

Hardbottom Pavement

This mapping unit consists of nearly level and/or gently sloping consolidated rock substrate that has minimal stony coral, soft coral and/or macroalgae cover. This community was predominately encountered in areas where water depth was less than 15 ft (about 5 m) and where it is likely that the lack of epibenthic corals, sponges and other attached marine life is attributable to intermittently extremely rough seas that prevent corals and macroalgal communities from becoming established. Fish and epibenthic fauna were minimally present. Photo 4-3 is representative of this community.

From a qualitative perspective, the Hardbottom Pavement community was rated as Poor, due primarily to the low biodiversity and absence of stony corals and octocorals.

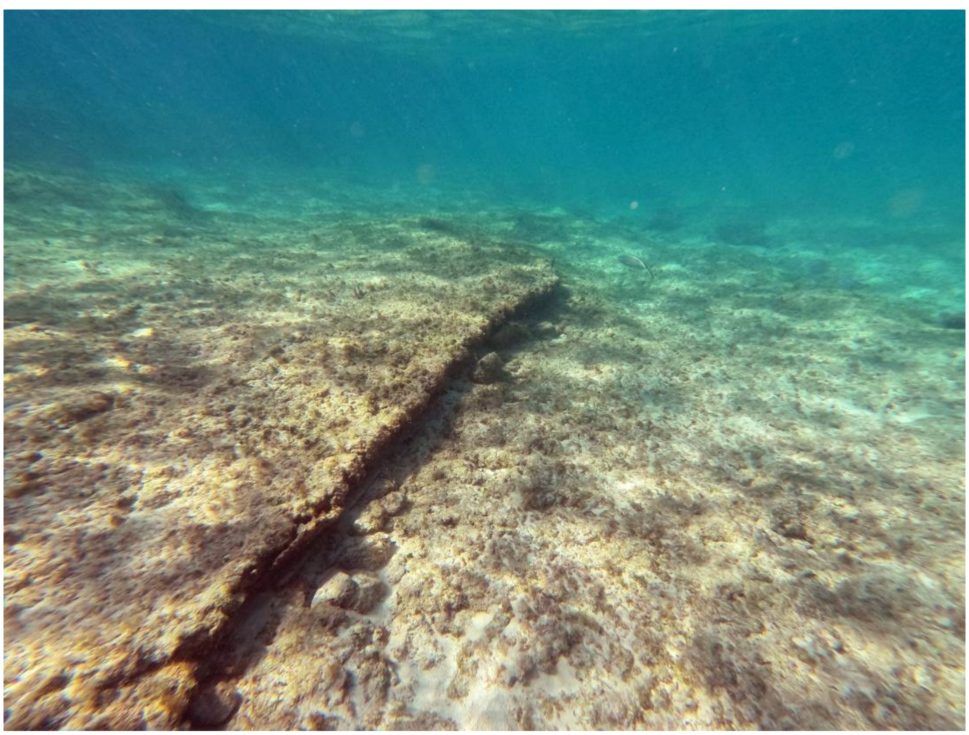


Photo 4-3. Typical Hardbottom Pavement (February 3, 2023)

<u>Hardbottom with Macroalgae</u>

A substantial portion of the assessment area to the south and west of the southern tip of the island was mapped as Hardbottom with Macroalgae. Although seagrasses and low-profile corals may be minimally present, epibenthic vegetation in this mapping unit consists primarily of macroalgae, primarily phaeophytes, including *Dictyota*, *Padina*, *Turbinaria* and rooted *Sargassum*. Within the boundary of this overall mapping unit, several small polygons of seagrass-dominated areas or other anomalous communities existed. Photo 4-4 is representative of this community.

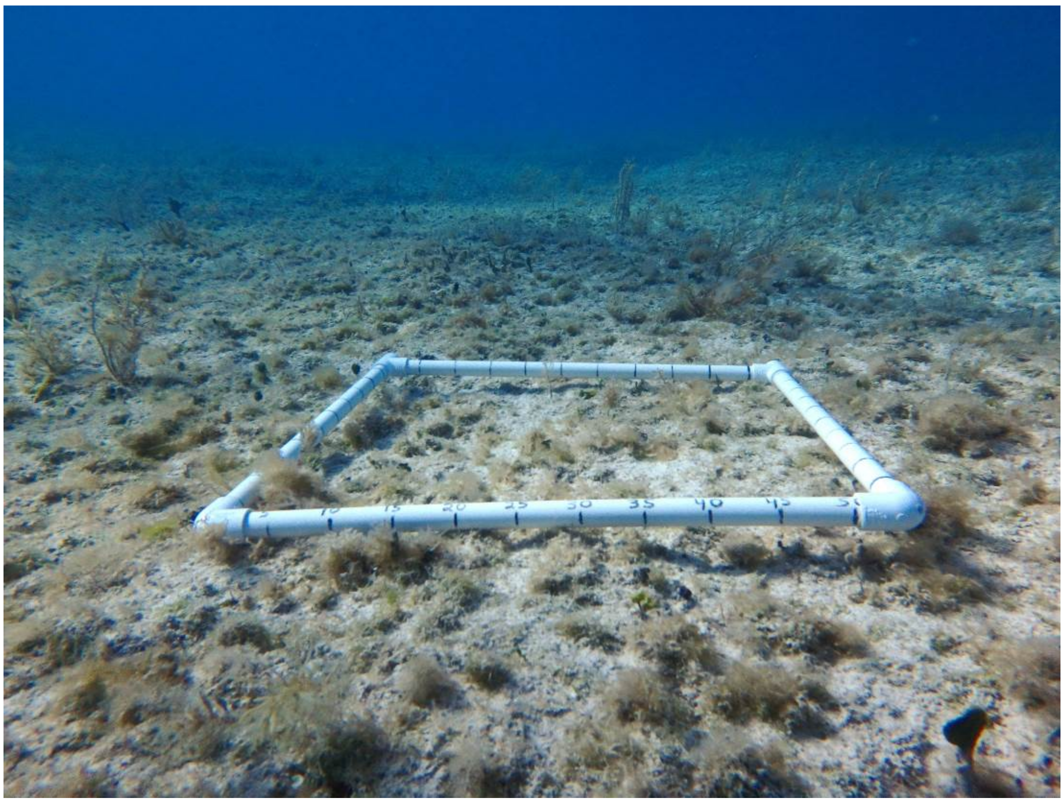


Photo 4-4. Typical Hardbottom with Macroalgae (February 3, 2023)

From a qualitative perspective, the Hardbottom with Macroalgae community was rated as Good. The overall functional value of this community is lower than coral reef areas, but what was present was in good condition. Although stony corals were infrequent, sea fans and fire corals appeared to be in excellent condition, particularly given the intermittently rough conditions in which they exist.

Hardbottom with Macroalgae and Octocorals

Sea rods and sea plumes, abundant along the east side of the assessment area, extending to lengths of 3 to 6 ft (1 to 2 m) were the dominant sedentary corals in this community. Coral densities varied significantly, but were generally from 5 to 15 percent cover. Juvenile reef-fish, including damselfish, tangs, and wrasses, were abundant in this community. Photo 4-5 is representative of this community.

Photo 4-5. Typical Hardbottom with Macroalgae and Octocorals (February 3, 2023)

From a qualitative perspective, the Hardbottom with Octocorals community was rated as Good. Although stony corals were infrequent, sea fans and fire corals appeared to be in excellent condition, particularly given the intermittently rough conditions in which they exist.

Hardbottom with Macroalgae and Sand

As the depth increased off the southeast face of the assessment area, the makeup of the Hardbottom community transitioned to an area where coral species were minimally present and epibenthic macroalgae was more abundant. A thin veneer of sand had accumulated in pockets, perhaps redistributed by storm conditions and rough seas. Photo 4-6 is representative of this community.

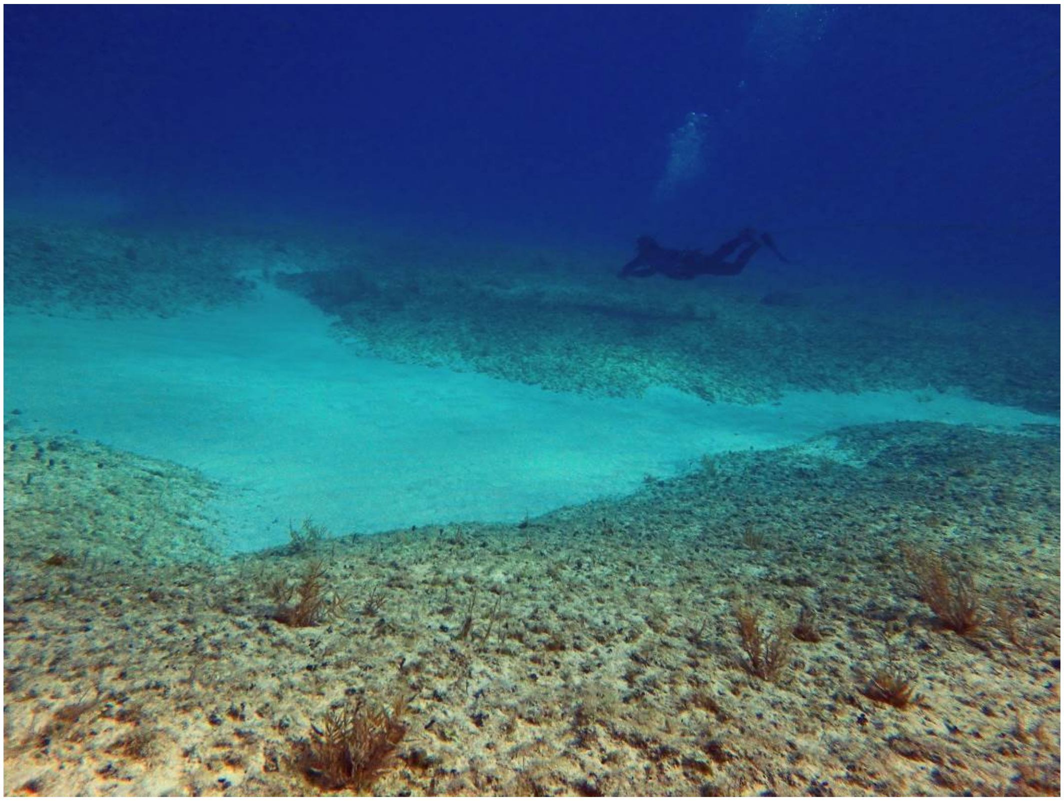


Photo 4-6. Typical Hardbottom with Macroalgae and Sand (February 3, 2023)

From a qualitative perspective, the Hardbottom with Macroalgae and Sand community was rated as Good. No significant natural or human-related impacts were observed.

Octocoral-Dominated Hardbottom

Primarily situated in a narrow band in shallows along the east-facing shore, some areas of hardbottom were densely populated with sea fans (*Gorgonia ventalina*), which were occasionally present in densities of dozens of colonies per square meter. In spite of intermittently rough seas, the sea fans swayed in the turbulent swash zone. Juvenile reef-fish, including damselfish, tangs, and wrasses, were abundant in this community. Photo 4-7 is representative of this community.

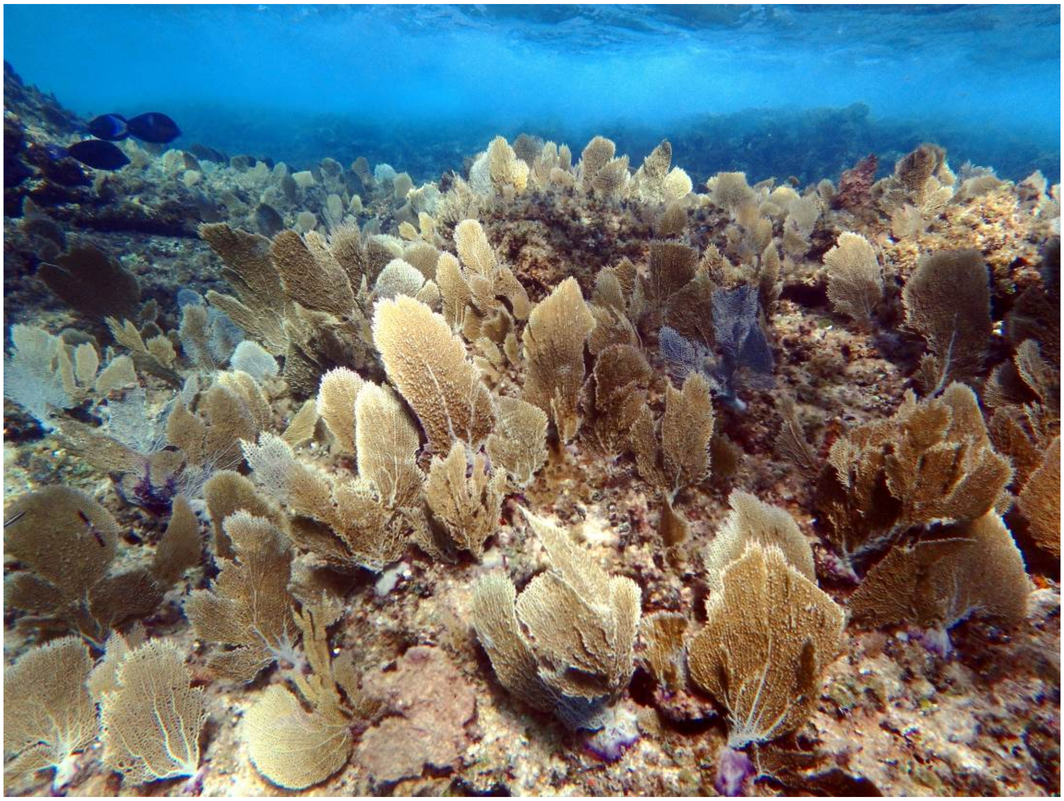


Photo 4-7. Typical Octocoral-Dominated Hardbottom (February 4, 2023)

From a qualitative perspective, the Octocoral-Dominated Hardbottom community was rated as Excellent. Although stony corals were infrequent, sea fans and fire corals appeared to be healthy, particularly given the intermittently rough conditions in which they exist. In spite of moderately heavy seas when the assessment was conducted in this area, sand was mostly absent, and the highly oxygenated water appeared to provide optimal conditions for this sea fan dominated community.

Hardbottom with Submerged Aquatic Vegetation

In areas that are less exposed to rough seas than the Hardbottom Pavement, particularly in the western part of the assessment area, the Hardbottom with SAV community has varying densities and assemblages of rooted seagrasses and/or macroalgae. Seaqrasses observed included *Thalassia testudinum* (turtle grass), *Syringodium filiforme* (manatee grass) *and Halodule wrightii* (shoal grass). Dominant macroalgae included Rhodophytes, including *Laurencia*; Phaeophytes, including *Dictyota* and *Sargassum*; and Chlorophytes, including *Acetabularia*, *Batophora*, *Halimeda*, *Penicillus* and *Udotea*. The densities of these seagrasses and rooted macroalgae varied considerably within this mapping unit, from fairly sparse (i.e., less than 5 percent cover) to moderate (i.e., 30 percent cover). Locations where seagrass densities exceeded 30 percent cover were mapped as Seagrass.

Juvenile reef-fish (e.g., damselfish, tangs, wrasses) and a large school of bonefish (*Abula vulpes*) were observed in this community. Photo 4-8 is representative of this community.

Photo 4-8. Typical Hardbottom with Submerged Aquatic Vegetation (February 3, 2023)

From a qualitative perspective, the Hardbottom with SAV community was rated as Fair. Coral fragments, which were infrequent, were primarily small colonies that had been broken and settled into the hardbottom community. Shallow depths and small grain size sediments that are easily suspended during periods of rough seas appear to prevent this community from maturing into a higher-quality community.

Low-Relief Reef

As water depths increased along the east and southeast edges of the assessment area, the macroalgae-dominated Hardbottom community transitioned to a fairly gently sloping, coral-dominated community. Stony corals, including *Siderastrea sidera*, *Siderastrea radians*, *Agaricia agaricites*, *Diploria labyrinthiformes* were present, but mostly comparatively small in size and in moderate to poor condition. octocorals, including sea whips (*Pterogorgia*, *Plexaurella*) and sea rods (*Antillogorgia*), were abundant. Reef-fish (e.g., damselfish, tangs, wrasses), hogfish, parrotfish, snapper, Nassau grouper were common in this community. Photo 4-9 is representative of this community.

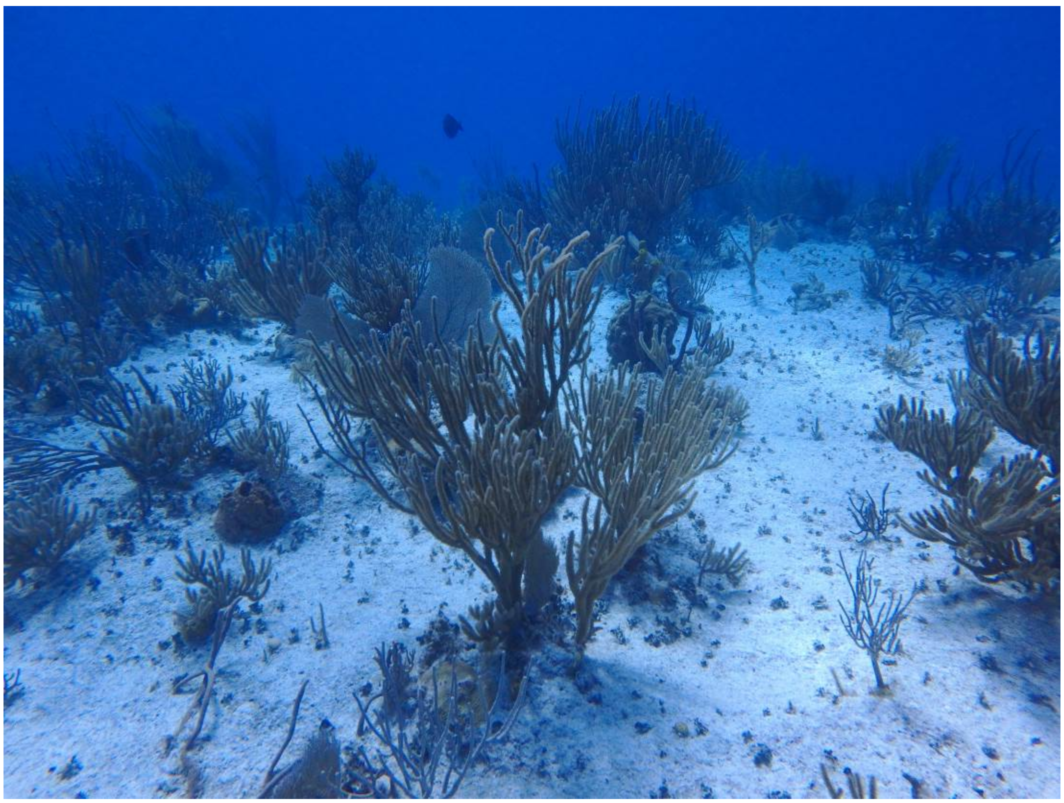


Photo 4-9. Typical Low-Relief Reef (February 6, 2023)

From a qualitative perspective, the Low-Relief Reef community was rated as Good or Excellent at varying locations. Stony corals were mostly small and in Poor condition. Octocorals were frequently greater than 3 ft (1 m) in height and appeared to be in Good or Excellent condition. Algae were mostly present in healthy abundances. No lionfish or other invasive species were observed in this area.

High-Relief Reef

Mostly situated along the southeast edge of the assessment area, the Low-Relief Reef, which was mostly in water depths of 20 to 40 ft (about 6 to 13 m) dropped off steeply toward the south in a community mapped as High-Relief Reef. Stony corals and octocorals, including all of the species present in the Low-Relief Reef community, in addition to pillar corals (*Dendrocygna cylindrus*), elliptical star corals (*Dichocoenia stokesii*), were also present in this community, and were mostly larger and in better condition than in the shallower, Low-Relief Reef. Reef-fish, including damselfish, tangs, wrasses, chubs, snapper, squirrelfish and grouper, were also common in this community, where the substrate had large voids that provided nooks, crannies and abundant surface areas for marine life. Several green turtles and reef sharks were observed in this community. Photo 4-10 is representative of this community.

Photo 4-10. Typical High Relief Reef (February 3, 2023)

From a qualitative perspective, the High-Relief Reef community was rated as Good and Excellent. Coral abundance and condition varied considerably along the 4,000-ft (1,215-m) length of this feature. Biodiversity was high; stony corals designated as Endangered, Threatened or Vulnerable were all present.

<u>Octocoral Reef</u>

One area in the central part of Folley Bay which is on the east side away from the proposed berthing area stood out from other portions of the assessment area as being an Octocoral Reef. Species diversity was considerably higher than in the nearshore Octocoral-Dominated Hardbottom described previously also in Folley Bay. At this location, where water depths varied from approximately 5 to 15 ft (about 1.5 to 5 m), sea rods (*Plexaura*) were dominant. Stony corals were minimally present, but the foundation upon which the octocoral were growing was largely the skeletons of previously deceased stony corals, including elkhorn (*Acropora palmata*), some of which appeared to have likely been 10 ft (about 3 m) or more in diameter when they were alive. Photo 4-11 is representative of this community.

Photo 4-11. Typical Octocoral Reef (February 6, 2023)

From a qualitative perspective, the Octocoral Reef community was rated as Good. Stony corals were mostly small and in Poor condition. Octocorals were frequently greater than 3 ft (1 m) in height and appeared to be in Good or Excellent condition. Algae were mostly present in healthy abundances. No lionfish or other invasive species were observed in this area.

Rubble

Only one narrow polygon of barren rubble was encountered, at a location in the northwestern portion of the assessment area. The unconsolidated substrate, which was less than 2 acres in size, consisted of fragments of long-dead corals. It is likely that water depths and intermittently impactful storms re-sort the substrate enough in this area that attached macroalgae, stony corals, and octocorals are unable to become established, and the lack of a sand substrate prevents colonization by seagrasses. Photo 4-12 is representative of this community.

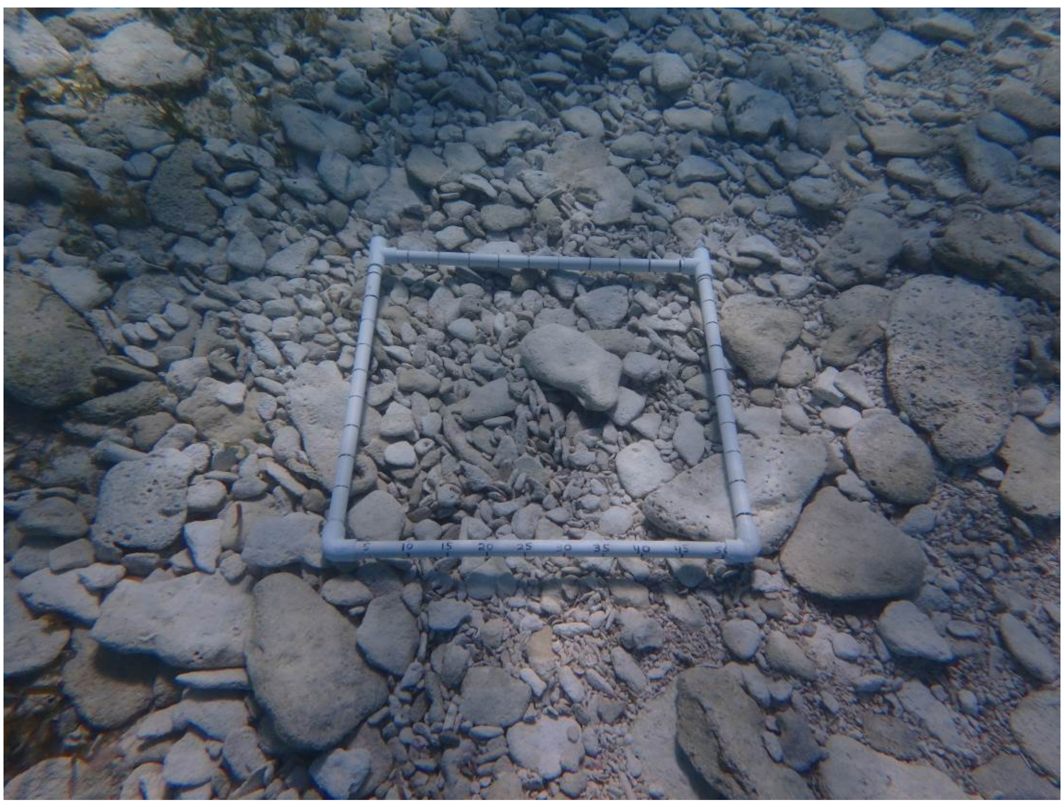


Photo 4-12. Typical Rubble (February 6, 2023)

From a qualitative perspective, the Rubble community was rated as Poor. Stony corals, octocorals, seagrass and rooted macroalgae were absent. No lionfish or other invasive species were observed in this area.

<u>Rubble with Macroalgae and Corals</u>

Two small polygons totaling less than 0.6 acre within the large Hardbottom with Macroalgae area on the west side of the site were uniquely different enough to warrant a separate classification unto themselves. Water depths in both of these areas were 5 to 25 ft (about 1.5 to 8 m) deeper than the surrounding areas, suggesting perhaps that geologic conditions or perhaps ship groundings of long ago had created these anomalous conditions. As a result of the deeper depths, a greater abundance of soft and stony corals was present. These corals were of larger size than in the surrounding areas, although they were not pervasive enough that the area warranted being mapped as Coral Reef.

Reef-fish (e.g., damselfish, tangs, wrasses, grouper, grunts) were observed in moderate numbers in this community. Photo 4-13 is representative of this community.

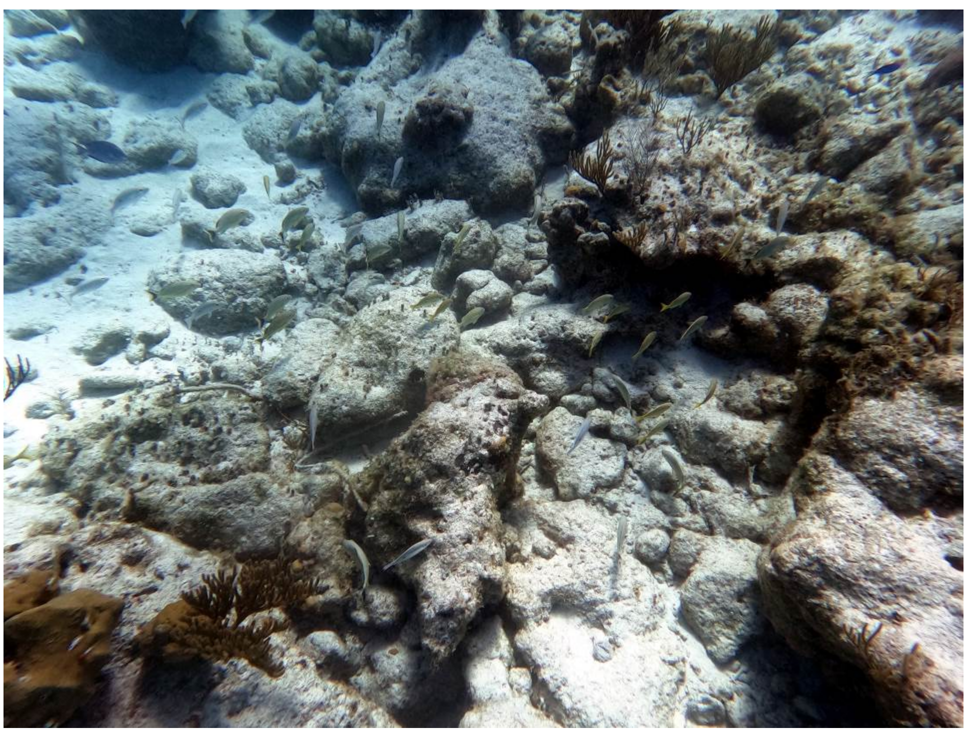


Photo 4-13. Typical Rubble with Macroalgae and Corals (February 5, 2023)

From a qualitative perspective, the Rubble with Macroalgae and Corals community was rated as Good, due primarily to the higher biodiversity of corals than in the surrounding areas.

Rubble with Submerged Aquatic Vegetation

Situated mostly in nearshore areas in the northwestern part of the assessment area, the substrate in this community was unconsolidated rock – primarily coral fragments on which macroalgae was attached. Seagrasses and rooted macroalgae were present, but mostly in sparse densities of less than 10 percent cover.

Juvenile reef-fish (e.g., damselfish, tangs, wrasses) were observed in low numbers in this community. Photo 4-14 is representative of this community.

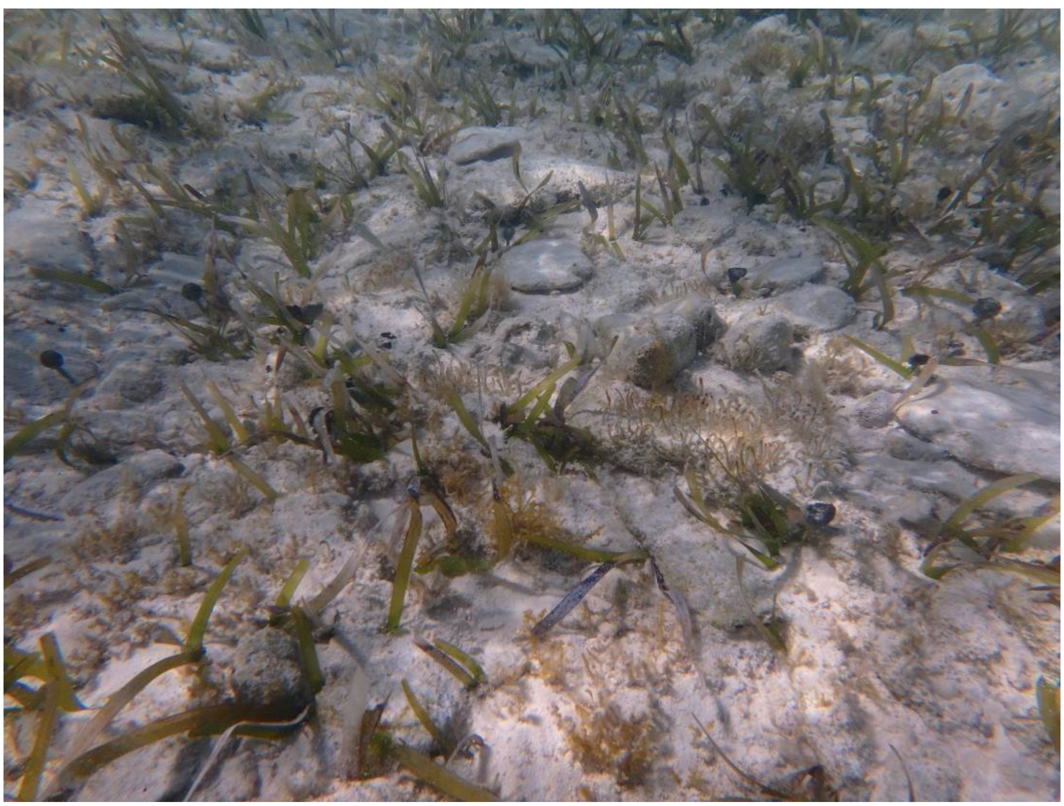


Photo 4-14. Typical Rubble with Submerged Aquatic Vegetation (February 5, 2023)

From a qualitative perspective, the Rubble with Submerged Aquatic Vegetation community was rated as Fair to Poor, due primarily to the low biodiversity and absence of stony corals and octocorals. It is likely that the loose substrate gets tumbled and redistributed during periods of rough seas, which prevents the establishment and survival of a more diverse assemblage of marine life.

<u>Sand</u>

Situated mostly in nearshore areas in the northwestern part of the assessment area, there were a few isolated areas where the sand substrate was mostly devoid of rooted seagrasses and macroalgae. The sand exceeded 6 to 12 inches [about 15 to 31 centimeters (cm)] in depth, and likely gets redistributed enough during periods of rough seas that rooted seagrasses and macroalgae are unable to become established.

Fish and other marine life were mostly absent (or unobserved), but it is likely that sand dollars (*Leodia sexiesperforata*), sea pens (*Pinna carnea*), sunray tellins (*Tellina radiata*) and other burrowing species are present in this community. Bonefish were observed here and in the Hardbotttom with Submerged Aquatic Vegetation community. Photo 4-15 is representative of this community.

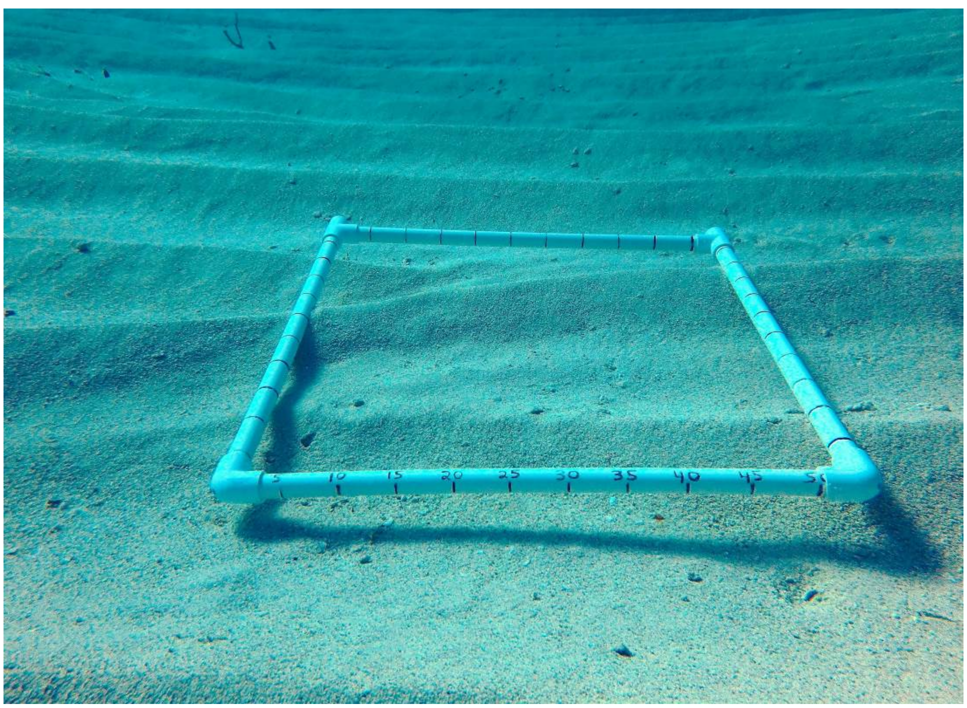


Photo 4-15. Typical Sand (February 3, 2023)

From a qualitative perspective, the barren Sand community was rated as Poor, due primarily to the low biodiversity and absence of stony corals and octocorals.

Sand with Hardbottom (or Hardbottom with Sand)

In some areas in the northwestern part of the assessment area, a comparatively thin layer of sand overlaid the Hardbottom substrate. The sandy sediments are likely mobilized during periods of rough seas, creating alternating conditions of exposed hardbottom and sandy patches, when the hardbottom is covered. Some juvenile reef-fish (e.g., mojarra, damselfish, tangs, wrasses) were present, but not abundant, in this community. Photo 4-16 is representative of this community.

Photo 4-16. Typical Sand with Hardbottom (February 5,2023)

From a qualitative perspective, the Sand with Hardbottom community was rated as Poor, due primarily to the comparatively low biodiversity and absence of stony corals and octocorals.

Sand with Submerged Aquatic Vegetation

Situated nearshore in the western part of the assessment area, a large polygon with a convoluted perimeter was found to be primarily Sand with Submerged Aquatic Vegetation, including varying abundances of both macroalgae and seagrass. As the nearby shoreline appears to be highly erosive, it is likely that the sand in this mapping unit has accumulated as a result of erosion from the landside Sand Strand community immediately to the east. The sandy sediments are likely mobilized during periods of rough seas, creating alternating conditions of exposed hardbottom and sandy patches, when the hardbottom is covered. Some juvenile reef-fish (e.g., mojarra, damselfish, tangs, wrasses) were present, but not abundant. Although no bonefish were observed during the assessment, this habitat is valuable foraging habitat for this species. Photo 4-17 is representative of this community.

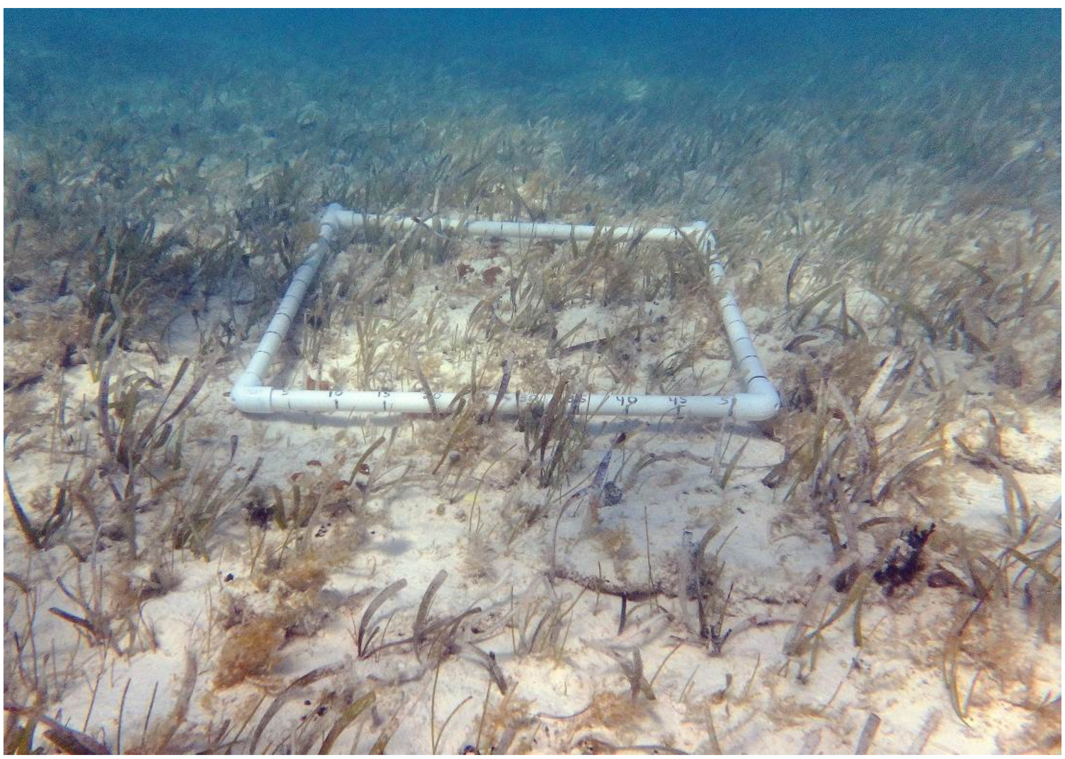


Photo 4-17. Typical Sand With SAV (February 5, 2023)

From a qualitative perspective, the Sand with Submerged Aquatic Vegetation community was rated as Poor, due primarily to the comparatively low biodiversity and absence of stony corals and octocorals.

Seagrass

Several areas of dense seagrass were present within the assessment area. On the west side of the assessment area, the darkest patches visible in aerial photographs within shallow waters (i.e., less than 6 ft (about 2 m)) were found to consist of primarily dense beds of turtle grass. Rooted macroalgae, including *Halimeda incrassata*, *Penicillus* spp. and *Rhipocephalus phoenix* were present, but were mostly a minor component of the overall cover, which, in some areas, exceeded 50 percent in total cover. On the east side of the assessment area, dense grassbeds of manatee grass were found to be present in sandy patches offshore of the Hardbottom communities, where water depths were 25 to 40 ft (about 8 to 13 m).

Seagrasses are well documented as being highly productive and valuable as habitat for juvenile fishes, queen conch and other marine life, and for stabilizing sediments. Photo 4-18 and Photo 4-19 are representative of these two types of Seagrass communities described.

Photo 4-18. Typical Dense Turtle Grass in Shallow Water on West Side of Assessment Area (February 4, 2023)

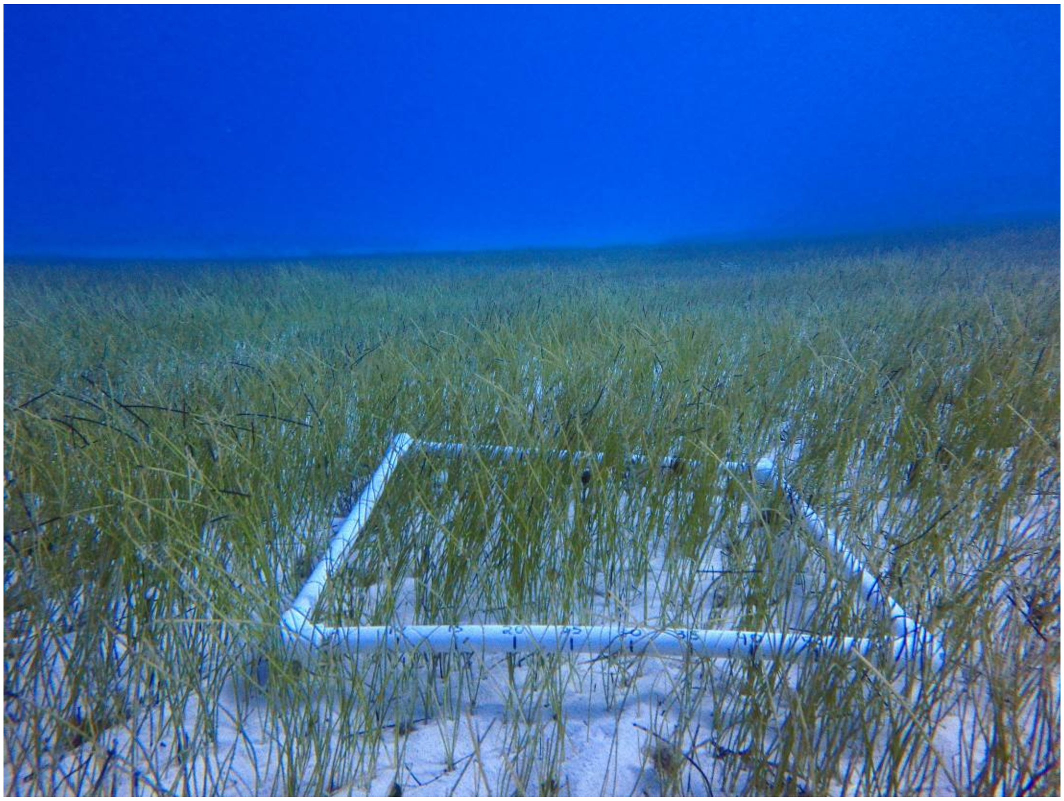


Photo 4-19. Typical Dense Manatee Grass in Shallow Water on Southeast Side of Assessment Area (February 3, 2023)

From a qualitative perspective, the Seagrass communities were rated as Excellent. With the exception of a few areas where the grassbeds in the shallows had current-induced erosion along their periphery, they appeared to be in Excellent condition.

Submerged Aquatic Vegetation

Submerged Aquatic Vegetation consists of seagrasses and macroalgae that are rooted in sand. In some areas, this community was present overlaying a Hardbottom community. As described in the Hardbottom with Submerged Aquatic Vegetation community, common components of this community include manatee grass, turtle grass, shoal grass, and various species of red algae, brown algae and green algae. The comparative abundance of these species varied widely in different areas. Rooted macroalgae were generally more abundant than seagrasses, but cumulative cover varied from less than 5 percent to approximately 35 percent. Areas where seagrasses were present in abundances greater than 35 percent and macroalgae were minimally present were mapped as Seagrass, as described previously.

Sea pens, cushion stars, mojarra, bonefish and juvenile reef-fish were observed in this community. Small colonies of rose corals (*Manicina areolata*), finger corals *(Porites porites*), black-ball sponges (*Ircinia strobilina*) and tunicates (Acidiaceae) were occasionally present in the SAV beds. Photo 4-20 is representative of this community.

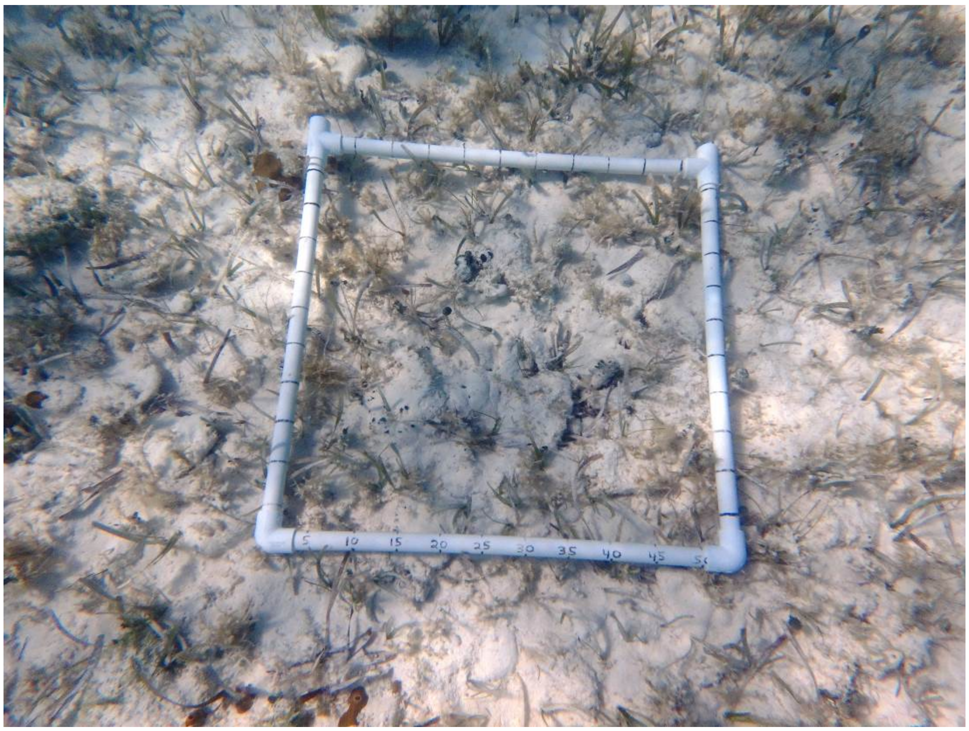


Photo 4-20. Typical Submerged Aquatic Vegetation (February 5, 2023)

From a qualitative perspective, the Submerged Aquatic Vegetation community was rated as Excellent. Except in a few areas where there was current-caused erosion along the periphery of the SAV beds, they appeared to be in Excellent condition.

4.6.3 Protected and Notable Species of Marine Life

Several of the corals, fish and other marine life observed during the assessment are species that are designated as Endangered, Threatened, Vulnerable or Least Concern by various international treaties, including the Convention on International Trade of Endangered Species (CITES) (Appendix C) and the International Union for Conservation of Nature World Conservation Union (IUCN) (Table 4-2) (Appendix D).

Table 4-2. Protected Marine Species Encountered and/or Likely to Occur within the Assessment Area

Common Name	Scientific Name	Designation	Comments
Corals			
Lobed Star Coral	*Orbicella annularis*	IUCN – Endangered	Uncommon, mostly below about 20 ft deep
Mountainous Star Coral	*Orbicella faveolata*	IUCN – Endangered CITES Appendix II	Common, variable depths – from less than 10 ft to greater than 100 ft deep
Boulder Star Coral	*Orbicella franksi*	IUCN – Vulnerable CITES Appendix II	Occasional, variable depths from shallow to coral walls greater than 100 ft deep and deeper reefs
Elliptical Star Coral	*Dichocoenia stokesi*	IUCN – Vulnerable CITES Appendix II	Common, mostly below about 20 ft deep
Lettuce Coral	*Agaricia agaricites*	IUCN – Least Concern CITES – Appendix II	Occasional, from shoreline rock to greater than 40 ft deep
Boulder Brain Coral	*Colpophyllia natans*	IUCN – Least Concern CITES – Appendix II	Occasional, mostly below about 20 ft deep
Grooved Brain Coral	*Diploria labyrinthiformis*	IUCN – Least Concern CITES – Appendix II	Occasional, mostly below about 20 ft deep
Pillar Coral	*Dendrocygna cylindricus*	IUCN – Least Concern CITES – Appendix II	Occasional, mostly below about 20 ft deep
Smooth Flower Coral	*Eusmilia fastigata*	IUCN – Least Concern CITES – Appendix II	Occasional, mostly below 20 ft deep
Golfball Coral	*Favia fragum*	IUCN – Least Concern CITES – Appendix II	Occasional, mostly 10 to 40 ft deep
Rough Star Coral	*Isophyllastrea rigida*	IUCN – Least Concern CITES – Appendix II	Uncommon, mostly about 15 to 30 ft deep Formerly *Isophylla rigida*
Rose Coral	*Manicina areolata*	IUCN – Least Concern CITES – Appendix II	Often on bottoms with sand and in SAV beds
Maze Coral	*Meandrina meandrites*	IUCN – Least Concern	Common, Mostly between 25 and 75 ft deep

Table 4-2. Protected Marine Species Encountered and/or Likely to Occur within the Assessment Area

Common Name	Scientific Name	Designation	Comments
Fire Coral	*Millepora alcicornis*	CITES – Appendix II IUCN – Least Concern	Abundant, from shoreline rock to greater than 30 ft deep
Blade Fire Coral	*Millepora complanata*	CITES – Appendix II IUCN- Least Concern	Abundant, mostly near shorelines and to about 10 ft deep
Maze Coral	*Meandrina jacksonii*	CITES – Appendix II IUCN – Least Concern	Occasional, mostly from about 20 ft to greater than 40 ft deep
Great Star Coral	*Montastrea cavernosa*	CITES – Appendix II IUCN – Least Concern	Occasional, mostly greater than about 20 ft deep
Ridged Cactus Coral	*Mycetophyllia* sp.	CITES – Appendix II IUCN – Least Concern	Occasional, mostly from about 25 to 75 ft deep
Mustard Hill Coral	*Porites astreoides*	CITES – Appendix II IUCN – Least Concern	Abundant, from nearshore shallows to greater than 30 ft deep
Finger Coral	*Porites porites*	CITES – Appendix II IUCN – Least Concern	Occasional, most colonies less than 6 inches tall, usually encountered at depths below about 15 ft
Knobby Brain Coral	*Pseudodiploria clivosa*	CITES – Appendix II IUCN – Least Concern	Common, from low-profile individuals near shoreline rock to larger colonies greater than 30 ft deep
Symmetrical Brain Coral	*Pseudodiploria strigosa*	CITES – Appendix II IUCN – Least Concern	Common, mostly greater than about 20 ft deep
Lesser Starlet Coral	*Siderastrea radians*	CITES – Appendix II IUCN – Least Concern	Common, mostly greater than 20 ft deep
Massive Starlet Coral	*Siderastrea sidera*	CITES – Appendix II IUCN – Least Concern CITES – Appendix II	Common, mostly greater than 20 ft deep

Table 4-2. Protected Marine Species Encountered and/or Likely to Occur within the Assessment Area

Common Name	Scientific Name	Designation	Comments
Other Marine Species			
Green Turtle	*Chelonia mydas*	CITES – Appendix II	Common
Queen Conch	*Strombus gigas*	CITES – Appendix II	Occasional (potentially over-harvested)
Nassau Grouper	*Epinephelus striatus*	IUCN - Endangered	Known pre-spawning aggregation area
Bonefish	*Albula vulpes*	Not listed, species of interest	Likely Pre-Spawning Aggregation Area
Hogfish	*Lachnolaimus maximus*	IUCN – Vulnerable	Common, adults and immatures

CITES = Convention on International Trade in Endangered Species of Wild Fauna and Flora
IUCN = International Union for Conservation of Nature

4.7 Landside Ecology

Field surveys to identify and evaluate landside flora and fauna on the properties included in Phase 1 of the proposed project were primarily conducted during December 2022. Vegetative community types were inspected and characterized and observations recorded regarding the presence of birds and other animal species. Communities were separated into Upland Communities, Wetland Communities (using the Bahamas National Wetland Policy) and Human-Altered Communities (e.g., roads, rock walls), where the natural vegetative communities were mostly absent.

It is notable that all of Long Island and nearby Hog Cay have been identified as one of 39 Important Bird Areas (IBAs) in the Bahamas (Birdlife International, 2008). The description of this site, BS026, states *Long Island supports a variety of habitats including shrubland, coppice, freshwater and saltwater wetlands, mangrove swamps and tidal flats*. (Appendix E)

The December timing of the field assessment was excellent for establishing a baseline inventory of wintering birds. However, it was not optimal for conducting surveys of breeding birds, so the potential for resident and migratory bird species at other times of the migratory cycle was addressed based on professional knowledge and consultation with local birders. Methods and results for these surveys are detailed in the following sections. Additional floral and faunal species that were observed during subsequent visits were recorded and added to the cumulative species lists (Appendix F). These lists should be considered as work-in-progress, which can be expanded with a focus on nesting and migratory birds that are observed during future site visits.

Qualitative ratings of landside communities consisted of the same Excellent, Good, Fair and Poor classifications described in Section 4.6.1.

4.7.1 Vegetation Diversity and Distribution

The primary vegetative assessment was conducted December 9 through 12, 2022. Field methodology consisted of visual inspections during pedestrian transects along the perimeter of the site on the south and west sides of the property and along pedestrian transects located in interior areas, primarily along previously cleared areas (unpaved roads, stone walls etc.) representative of all vegetative communities and along the perimeter of open water communities. High-resolution aerial photography was used as the basis for field surveys. Observations were recorded of plant and animal species encountered and, where appropriate, GPS coordinates were recorded at the edges of transitions zones and/or at other notable locations. In addition, the shoreline of project area from its southeastern tip to its northwestern tip were inspected by boat.

Vegetation was identified to species whenever possible. Approximately 100 vascular plant species of 45 families were identified within the various plant communities on the two properties that comprise Phase 1 of the proposed project. Appendix F provides the list of plant species observed, including the habitats in which each species was typically found and a rough approximation of the abundance of each species. Vegetative community classification generally follows *A Guide to Caribbean Vegetation Types: Preliminary Classification Systems and Descriptions* (Areces-Mallea et al., 1999). Using this classification system, the two properties were found to include six upland plant community types, five wetland community types and two human-related disturbed areas (Table 4-3). Phase 1 of the proposed project includes lands that are in private ownership and Crown Lands, so Table 4-3 identifies the acreages within each of these separate areas.

Figure 4-6 presents the vegetative cover, showing the location and juxtaposition of these community types. Vegetation mapping was conducted using high-resolution satellite aerial photography with limited ground-truthing. Figure 4-6 was developed using a combination of recent high-resolution (i.e., 50 cm) satellite photography, and both recent and historical Google Earth images. The following narrative provides general descriptions of the vegetative community types found within Phase 1 of the Calypso Cove project: Upland Communities, Wetland Communities, and Human-Altered Areas.

4.7.1.1 Upland Communities

Dry Broad-Leaved Evergreen Forest (DBEF)

The majority of the vegetation within Phase 1, 190 acres (42 percent), can be classified as Dry Broad-Leaf Evergreen Forest (DBEF). This vegetative community consists of dense, closed-canopy forest with a diverse tree assemblage. Photo 4-21 is representative of the typical tree density and canopy closure encountered in this vegetative community.

Table 4-3. Landside Community Types

Vegetative Community	Code	Area (Acres) Private-(South)	Crown Lands in Phase 1	Total	Percent of Total
Upland Habitats					
Dry Broad-Leaved Evergreen Forest	DBEF	87.87	87.16	189.94	
Coastal Coppice	CC	0.09	63.01	64	
Sand Strand	SS	9.39	12.5	22.69	
Australian Pine Dominated Sand Strand	AP-SS	1.45	3.31	5.51	
Coastal Rock	CR	0		32.52	
Non-vegetated					
Sandy Beach	NV-Sand			25.41	
Wetland Habitats					
Tidal Creek	TC			0.54	
Mixed Mangroves	MM			5.18	
Conocarpus erectus	Ce			22.27	
Salinas	S			63.73	
Estuarine Herbaceous	EH			0.53	
Human Altered Areas					
Roads, Unpaved and rock walls	D-Rd			16.28	

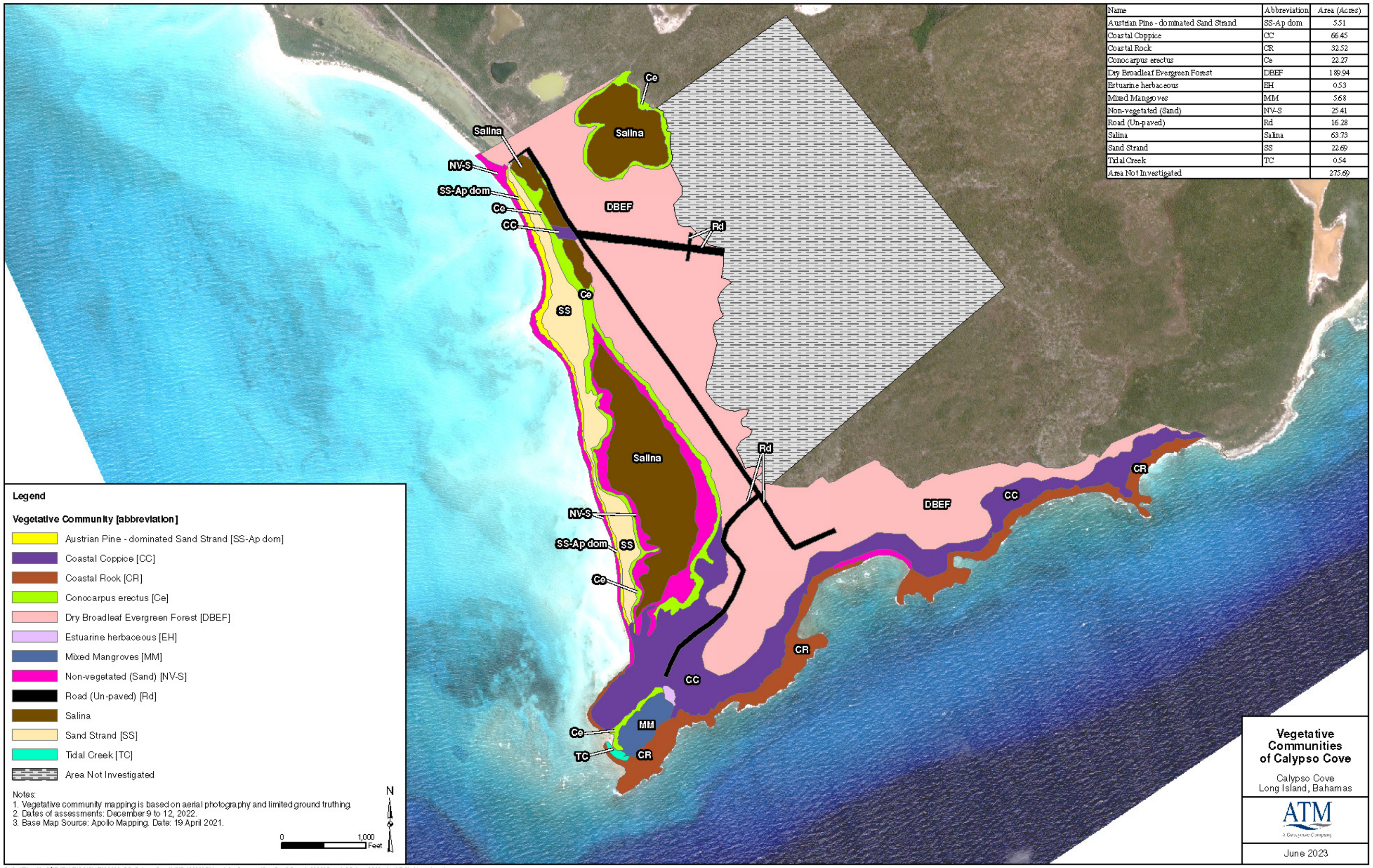


Figure 4-6. Vegetative Communities of Calypso Cove

Photo 4-21. Typical Dry Broadleaf Evergreen Forest (December 12, 2022)

Except in areas where it abutted disturbed areas, the DBEF community typically began at the landward edge of the coastal coppice and continued up-slope to the height of the land.

Common tree species included gum elemi (*Bursera simaruba*), poisonwood (*Metopium toxiferum*), cinnecord (*Vachellia choriophylla*) and darling plum (*Reynosia septrionalis*). Mature lignum vitae trees (*Guaiacum sanctum* and *G. officinale*) were common in the DBEF. Sub-canopy species included maiden bush (*Savia bahamensis*) and box brier (*Randia aculeata*). Vines included prickly saw-brier (*Smilax havanensis*) and devil's pumpkin (*Passiflora cupraea*), Epiphytic orchids (*Encyclia* spp.) and air plants (*Tillandsia* spp.) were present in healthy abundances.

Soils within the DBEF were poorly developed and typically included a thin peat layer over the underlying limestone.

Bird species observed within the DBEF community included thick-billed vireo (*Vireo crassirostris*) and white-crowned pigeons, a species whose diet includes the fruit of two of the most common trees, poisonwood and gum elemi. *Anolis* lizards were occasionally observed.

From a qualitative perspective, the Dry Broadleaf Evergreen Forest community was rated as Excellent. Biodiversity was high, it was free of invasive pest plants, hydrology appeared intact, and floral and faunal species designated as Endangered, Threatened or Vulnerable were all present.

Dry Broadleaf Evergreen Forest – Coastal Coppice

Within the overall category of DBEF, areas in close proximity to the shore, where vegetation height and/or species composition was affected by salt spray, were mapped as DBEF-CC (Photo 4-22). This community occupied approximately 66.5 acres (15 percent) of the assessment area. Although the canopy was still enclosed, tree height was lower than in interior areas, and species included those more tolerant of coastal conditions.

Photo 4-22. Typical Coastal Coppice (December 12, 2022)

Common tree species included pigeon plum (*Coccoloba diversifolia*), seven year apple (*Genipa clusiifolia*), sea grape (*Coccoloba uvifera*), and wild lime (*Zanthoxylum fagara*). Sub-canopy species included canker berry (*Solanum bahamense*), Joe-wood (*Jacquinia keyensis*) and sage cop (*Lantana involucrata*). Vines included lice bush (*Pentalinon luteum*) and soldier bush

(*Myriopus volubilis*). Epiphytic orchids (*Encyclia* spp.) and air plants (*Tillandsia* spp.) were also present, but less abundant than in the DBEF.

Soils within the DBEF-CC were very poorly developed and typically included a thin layer of organics and/or sand over the underlying limestone.

Bird species observed within the DBEF-CC included common ground-doves (*Columba passerina*) and Bahamas woodstar humming birds (*Calliphlox evelynae*). *Anolis* lizards were occasionally observed.

From a qualitative perspective, the DBEF-CC community was also rated as Excellent. Biodiversity was high, it was free of invasive pest plants, hydrology appeared intact, and floral and faunal species designated as Endangered, Threatened or Vulnerable were all present.

Coastal Rock (CR)

Approximately 32.5 acres (7 percent of the project's shoreline) consisted of a Coastal Rock community. The Coastal Rock community consisted primarily of exposed ironshore (also known as dog-toothed limestone), which, in general, was very steep on the east side of the property and nearly level at the southwestern tip and along the southwestern side. This habitat is described as the shoreline feature (Section 4.6.2 and Photos 4-1 and 4-2)

With interruption on the east side only by a stretch of sandy beach at Folley Bay, the Coastal Rock community began below the water line along most of the shoreline and continued up-slope for varying distances of 5 to 15 m (16 to 49 ft), based on the slope and degree of exposure to intermittently heavy seas. As is typical of this community on exposed shores, the rock was mostly barren near the water's edge. As the distance from shore increased, vegetation included low-growing herbs and shrubs growing from fractures in the weathered rock. The most abundant plants in the Coastal Rock community were sandfly bush (*Rhachicallis americana*) and buttonbush (*Conocarpus erectus*). In general, the Coastal Rock community transitioned from being devoid of vegetation on its waterward boundary, through a sparsely vegetated zone, to its ecotone with the DBEF Coastal Coppice.

Faunal species encountered in the Coastal Rock community were primarily marine mollusks (e.g., chitons, nerites). Bird species observed during the investigation in the coastal rock community included birds in flight (e.g., frigatebirds. ospreys) and various shorebird species that foraged on shoreline mollusks, including oystercatchers and ruddy turnstones. An osprey nest, which was unoccupied during the December site assessment, was present on the rocks atop a craggy protrusion at the height of the land along the eastern shore (Figure 4-7, Notable Landslide Features). December is not nesting season for this species, however, ospreys are known to reuse nests year after year if they have been successful in raising young. It is likely that they will return to this site during future nesting seasons.

Antillean nighthawks (*Chordieles gundlachii*) are well known for nesting in non-vegetated areas of coastal rock, where eggs are laid on open rock or shallow scrapes in the sand. December is also not nesting season for this migratory species; avian surveys during the nesting season are warranted to more accurately identify potential impacts.

From a qualitative perspective, the Coastal Rock community was rated as Excellent. This geologic feature provides shoreline protection and resilience to sea level rise. Biodiversity is naturally low in this community, so the conditions observed are consistent with what is typical. Along a portion of the easterly facing coastal rock, portions had sloughed off into the sea, an indication that exposure to both prevailing southeasterly breezes and the full brunt of hurricane and tropical storm force winds will likely continue to have intermittent adverse impacts on shoreline stability of the Coastal Rock community.

Barren Sand

Approximately 4,000 linear feet (about 50 percent of the shoreline within the assessment area) consisted of a barren, unvegetated beach. A small percentage of this was located along the northerly stretch of shoreline in Folley Bay (Photo 4-23), where there was little pioneer plant zone or primary dune. The majority of the sandy beach was present on the west-facing portion of the assessment area, extending from the northern property line south to near the southern tip. In this area, except where Australian pines were present, the beach was gently sloped.

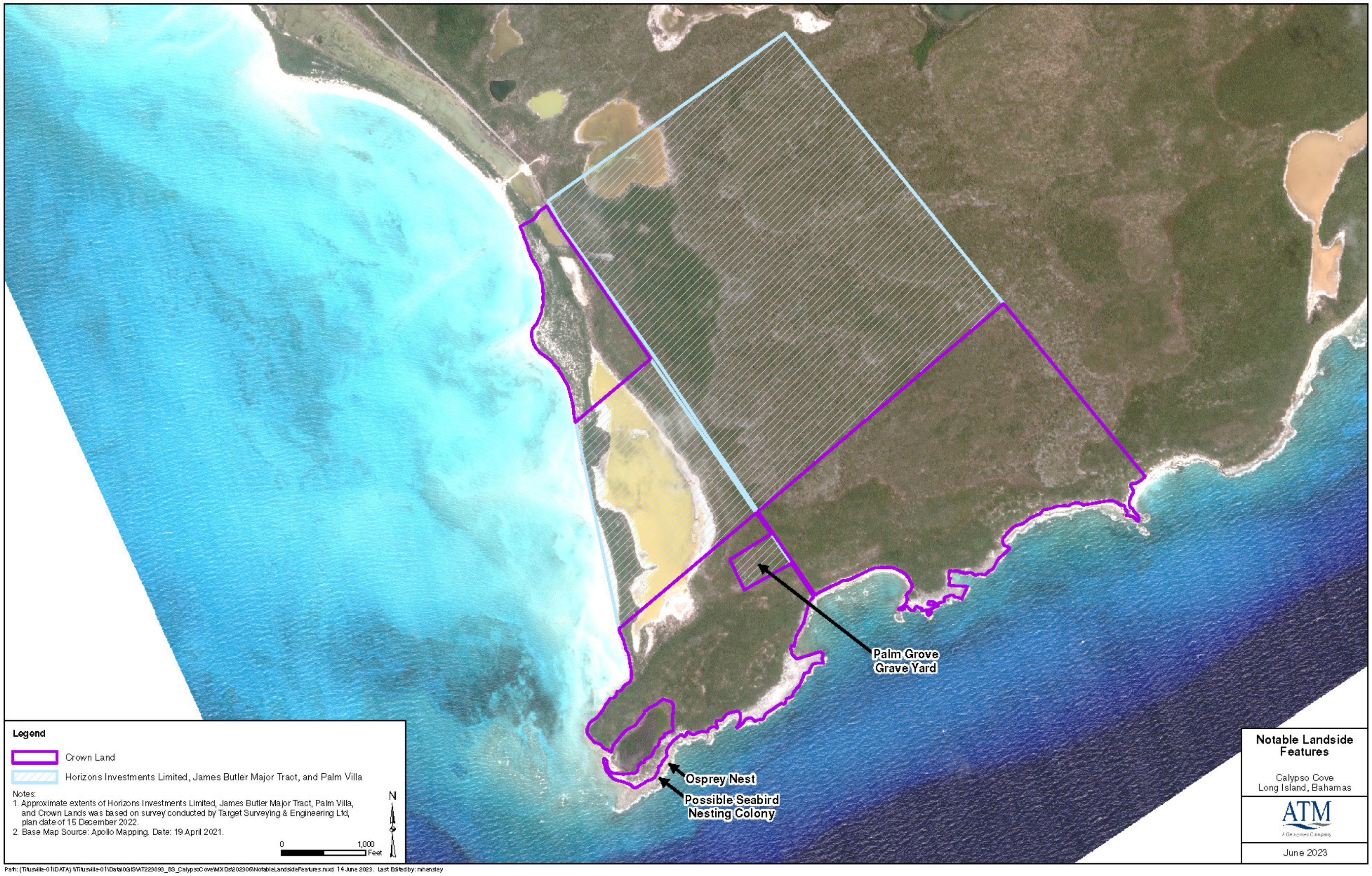


Figure 4-7. Notable Landslide Features

Photo 4-23. Barren Sandy Beach at Folley Bay (December 11, 2022)

Landward of the Barren Sand was a transition zone to pioneer plants (Photo 4-24), then a well-established primary dune of varying height and a further transition to Sand Strand community. Storms redistribute the sand, alternatively eroding beaches in some areas and accreting it in other areas. On the western side of the project, sand appears to cover an underlying, gently sloping, coastal rock feature, alternately burying and exposing it.

Sandy beaches provide habitat for a variety of biota, including shorebirds that forage and/or nest, ghost crabs (*Ocypode albicans*) that excavate burrows above MHW, and interstitial organisms (e.g., *Donax* clams, amphipods etc.) that are intermittently abundant at some sites, particularly at sites that are adjacent to inlets and passes.

Photo 4-24. Typical Sandy Beach with Established Pioneer Plant Zone (December 11, 2022)

The presence of adult and juvenile Wilson's plovers suggest that nesting by this species is likely, although the December time of the field investigation is not nesting season for this species. It is recommended that surveys be conducted for shorebirds, so that site-appropriate protection protocols can be developed and implemented to minimize disturbance to nesting and foraging by these species, which are likely to also include other plover species (semi-palmated plovers, black-bellied plovers, Endangered piping plovers, snowy plovers), and others (e.g., willets, ruddy turnstones, etc.). Individuals of several shorebird species have been shown to adapt well to the presence of humans, but the potential need to develop protection protocols can only be determined after additional pre-project, baseline surveys for shorebirds are conducted.

Sandy beaches are well known for nesting by sea turtles, marine reptiles that come ashore to lay their eggs. Although the profile and characteristics of the beaches appeared suitable for potential nesting by sea turtles, no tracks or other evidence of nesting sea turtles were observed. However, December is not nesting season for sea turtles, so it is not surprising that no evidence was observed of turtle nesting during the landside investigation. No data have been located that indicate that marine turtles nest on the beaches at the site, but observations of juvenile and adult green turtles (*Chelonia mydas*) in the nearshore waters at the site suggest that nesting may occur. Successful sea turtle nesting at other sites has been shown to be highly dependent on implementation of management strategies that minimize disturbance of nesting females, nests, and emerging young. Surveys for nesting turtles are recommended at the subject site, so that appropriate, site-specific protection protocols can be developed and implemented to minimize adverse impacts on these species, all of which are designated for protection as Endangered or Threatened species.

From a qualitative perspective, the sandy beaches were rated as Excellent (Folley Bay) and Good on the western shoreline. Australian pine trees (*Casuarina equisetifolia*) were abundant at the higher reaches along most of this beach, as is described in the *Casuarina*-dominated Sand Strand community. This species is designated as a highly invasive non-native (Section 4.7.2).

Needles of standing *Casuarina* are known to acidify surface sands and adversely affect native dune and pioneer plants due to their allelopathic properties. This condition was evident at the site, indicating that an invasive species control programme should be developed and implemented.

Sand Strand (SS)
Approximately 22.7 acres (5 percent of the assessment area) consisted of a Sand Strand community, a vegetative community located landward of sandy beaches. Although the diversity of Sand Strand vegetation is naturally very low, vegetation encountered in this community included sea oats (*Uniola paniculata*), silver top palms (*Coccothrinax argentata*), seven-year apple, sea grapes, sea lavender (*Argusia gnaphalodes*), inkberry (*Scaevola plumieri*), beach creeper (*Ernodea littoralis*) and other species that thrive in the deep, and comparatively sterile, sandy soils. Photo 4-25 is representative of this community.

Photo 4-25. Typical Sand Strand Community (December 11, 2022)

This community was only found to be present on the western flank of the assessment area, extending most of the variable-width distance from the upper extent of the sandy beach eastward toward the *Conocarpus* that exists along the eastern edge of the salina.

Bird species observed and/or heard within the sand strand included Wilson's plovers, Bahamas woodstar hummingbirds, bananaquits and thick-billed vireos.

From a qualitative perspective, the Sand Strand community landward of the Australian pines was rated as Excellent. Floral and faunal species abundance and diversity was appropriate.

Australian Pine Dominated Sand Strand (AP Dominated SS)

Approximately 5.5 acres (1 percent of the assessment area) consisted of a *Casuarina*-dominated corridor (Photo 4-26), in the transition zone between the sandy beach and the Sand Strand community. The only location within the assessment area where this non-native pest plant was observed was on the western waterfront. *Casuarina* were present in sufficient abundance and density that they were having a significant adverse effect on native plant communities.

Photo 4-26. Typical Australian Pine Dominated Sand Strand (December 11, 2022)

In these areas, the combination of many years of accumulation of pine needle duff, acidification of surface soils, and decreased sunlight reaching the forest floor have resulted in the gradual loss of native understory vegetation. Analysis of historical satellite imagery suggests that *Casuarina* have been present in this area for at least 15 years. In areas where the *Casuarina* trees have become a pervasive monoculture, native canopy, shrub and groundcover vegetation is non-existent. At several locations along the west-facing beach, erosion had caused the trees to topple (Photo 4-27).

Although *Casuarinas* are poor habitat for wildlife, black-faced grassquits (*Tiaris bicolor*), common ground doves (*Columba passerina*), and white-crowned pigeons are known for using them for roosting, foraging and/or nesting.

Photo 4-27. Australian Pines Toppled due to Beach Erosion (December 11, 2022)

From a qualitative perspective, the Australian Pine Dominated Sand Strand was rated as Poor, the lowest-ranked vegetative community within the assessment area. Biodiversity was low, and floral and faunal species designated as Endangered, Threatened or Vulnerable were absent. An invasive species removal and/or management plan should be developed and implemented.

4.7.1.2 Wetland Communities

Mixed Mangroves (MM)

Within the southern tip of the project site, approximately 5.7 acres (1.2 percent of the assessment area) was found to be a Mixed Mangrove community (Photo 4-28) that consisted primarily of intertidal red mangroves (*Rhizophora mangle*) nearest to the water and black mangroves (*Avicennia germinans*) and white mangroves (*Laguncularia racemosa*) being present in lower numbers, and in varying stages of maturity, at slightly higher elevations. A tidal creek situated on the west side of this feature (Photo 4-29) appeared to allow tidal inundation of portions of this community. Mangroves near the upper (i.e., northeast) perimeter of this feature appeared stunted, perhaps, in part, due to limited tidal exchange and/or a lesser depth of peat overlying a limerock substrate.

Photo 4-28. Mixed Mangrove Community at Low Tide (December 11, 2022)

Photo 4-29. Typical Tidal Creek (December 11, 2022)

Mature buttonwood trees (*Conocarpus erectus*) of varying heights were present along the perimeter of most of this feature, and the presence of flotsam indicated that storm surge intermittently reaches this area, which apparently also provides a natural resilience to sea level rise. The only area of herbaceous estuarine marsh within the assessment area was along the northeastern perimeter of this feature.

Wading birds, including great blue herons, reddish egrets, great egrets and green herons were observed foraging, as was a belted kingfisher, a fish-eating migratory species that spends the fall, winter and early spring in The Bahamas and other lower-latitude areas before returning to northerly latitudes across the central United States and Canada for summertime nesting.

From a qualitative perspective, the mixed mangrove community was rated as Good. The hydrology appeared to be currently intact, no invasive non-native floral or faunal species were observed, and this community appears to provide an excellent buffer for long-term sea level rise.

<u>Tidal Creek</u>

A narrow, curvilinear mangrove-lined tidal creek (Photo 4-29) approximately 500 ft (about 150 m) in length was found to provide flushing from the sound into and out of the Mixed Mangrove area.

Wading birds and shorebirds were observed in this area. Although no bonefish were seen in this area during the site investigation, mangrove-line tidal creeks in The Bahamas are well documented to provided valuable habit for bonefish.

From a qualitative perspective, the tidal creek community was rated as Good. It is extremely narrow and shallow, which appears to make it vulnerable to becoming closed off from the sound, when/if storms deposit storm-transported sand across its opening, at which time the then-landlocked Mixed Mangrove community could be under stress with stagnant water, and unhealthy salinity levels.

Salinas

Three open-water Salinas were present within the assessment area. Two of these were fairly long, narrow, north-south oriented and located waterward (i.e., west) and parallel to an existing unpaved access road in the western portion of the property. It appeared that these ponds may be connected during periods of high water and are the extension of a coastal salt pond complex that stretches over 5 miles (7 km) toward the north, and includes the former Diamond Crystals salt works. No direct connection to the Sound was observed, but at their nearest locations, the western edges of these ponds were less than 200 ft (about 85 m) from the open waters of the Sound. Salinity values in December 2022, were 67 parts per thousand (ppt) for the north pond and greater than 130 ppt for the south pond. The south pond is considerably wider and had a wider area of exposed shoreline at the time of the investigation. Photo 4-30 and Photo 4-31 show conditions in these ponds during the assessment.

Wading birds, including reddish egrets and plovers, including killdeer, were observed in these ponds and/or foraging along their shorelines. Some salinas are well known for providing habitat for flamingos, but none were observed in either of these ponds at the time of the assessment.

A third salina, generally rounder in shape, was found to be present to the east of the access road near the north boundary of the property. A rock wall, likely a former property boundary, extended from the road to the western edge of the pond. Lesser yellowlegs were observed foraging near the southwestern shoreline of this pond, which had a salinity of 51 ppt on December 9, 2022 (Photo 4-32).

From a qualitative perspective, the salinas were rated as Good. Further analysis over a longer period would be needed to determine salinity highs and lows and populations (or lack thereof) of aquatic organisms that might attract flamingos and/or other wading birds. While salinas are largely disparaged due to their odors, bugs, and/or general unaesthetic appeal, they do provide habitat for a variety birds, including nesting habitat for breeding birds (e.g., black-necked stilts and white-cheeked pintails) and wintering habitat for migratory species (e.g., blue-winged teal, scaup) that is not present in other areas of the property. They also provide a measure of coastal resilience, as they are accustomed to highly variable water and salinity levels.

Photo 4-30. Northwest Salina; View Looking North (December 9, 2022)

Photo 4-31. Southwest Salina, View Looking Northeast from West Shore (December 11, 2022)

Photo 4-32. Yellowlegs Foraging along Southern Shore of Northeast Salina (December 10, 2022)

Estuarine Herbaceous

One small (0.5 acre) area of estuarine herbaceous habitat was located along the northeastern perimeter of the Mixed Mangrove area in the southern part of the assessment area (as noted in Section 4.7.1.2). Woody glasswort (*Sarcocornia virginica*) was the dominant vegetation in this area (Photo 4-33), although in some areas, it was a groundcover species under a sparse *Conocarpus erectus* shrubland.

From a qualitative perspective, the Estuarine Herbaceous habitat was rated as Good. Further analysis over a longer period would be needed to determine salinity and water fluctuations, but the presence of wading birds suggested this area likely provided habitat for crabs and other species of wading bird prey that may not be present in other areas of the property. This wetland habitat also provides a measure of coastal resilience, as it is accustomed to highly variable water and salinity levels.

Photo 4-33. Woody Glasswort in Estuarine Herbaceous Habitat (December 10, 2022)

<u>*Conocarpus erectus* (Buttonwoods)</u>

Although not a habitat identified in *A Guide to Caribbean Vegetation Types* (Areces-Mallea, 1999), several near monoculture stands of buttonwoods were different enough from surrounding areas that they warranted a separate designation. Trees were mature, but varied considerably in height, based on the thickness of soil overlaying the rock substrate. At locations where the mucky soils were thickest, trees were in excess of 20 ft (3 m) in height. In areas where they were growing directly out of the rock, they were frequently less than 3 ft (1 m) in height.

Buttonwoods are considerably more tolerant of wide ranges of water levels and soil salinity than most other tree species, which explains their frequent presence along the edges of salt ponds. Both green buttonwoods (Photo 4-34) and silver buttonwoods, which are frequently used as a landscape species, were common.

Photo 4-34. *Conocarpus erectus* (December 10, 2022)

From a qualitative perspective, the *Conocarpus* stands were rated as Good. While this community has very low biodiversity, it provides a valuable function in resiliency to changes in water level. Even when flooded for extended periods of time following hurricanes or other tropical storms, *Conocarpus* frequently survive by growing adventitious roots that allow their survival until water levels subside to “normal” levels.

4.7.1.3 Human-Altered Areas

Disturbed Areas

Although most of the properties were found to have relatively intact vegetative communities, several small areas, collectively totaling approximately 16.3 acres, were substantially disturbed as a result of the construction of roads and rock walls along property boundaries, as described hereafter.

Roads, Unpaved and Rock Walls

Several areas of the site consisted of cleared, but unpaved roads (Photo 4-35).

Photo 4-35. Typical Unpaved Road (December 9, 2022)

Several of these roads had been apparently cleared, or recently re-cleared before the December 2022 field assessment. Additionally, an east-west oriented, previously cleared area near the northern boundary had reportedly been cleared as a landing strip during the drug-smuggling era in the 1980s.

Rock walls, made of local limestone rock and generally 3 to 4 ft in height and approximately 6 to 7 ft wide at the base (Photo 4-36), were present along several property boundaries.

Protected Flora and Fauna

Sixteen plant species that are included in Forestry Declaration of Protected Trees Order were encountered during the investigation on the parcels included in Phase I of the Calypso Cove project (Table 4-4). Three of these are designated pursuant to Part I (Endemic or Endangered or Threatened Protected Trees). The remaining 13 of these are listed under Part II, as being Cultural, Historical and Economic Protected Species.

Photo 4-36. Typical Rock Wall (December 9, 2022)

The IUCN and CITES both maintain their own lists of floral and faunal species that occur in The Bahamas and which meet their respective criteria for designation. The IUCN's Red List for The Bahamas (IUCN, 2023) lists 2,530 floral and faunal species for marine, freshwater and terrestrial habitats, each of which has been assigned a designation based on its individual degree of rarity and vulnerability of extinction, using the following categories: Critically Endangered, Endangered, Threatened, Near Threatened, Vulnerable, Least Concern and Data Deficient (Appendix D). One-hundred forty-nine of the IUCN-listed species were encountered within the assessment area during the field investigations at the Calypso Cove site. The species encountered are highlighted in Appendix F. The majority of the IUCN-listed species encountered onsite are designated by IUCN as Least Concern. Landside species observed on the site that are designated as Critically Endangered, Endangered, Threatened, Near Threatened, and Vulnerable are identified in Table 4-4.

4.7.1 Animal Diversity and Distribution

Notes of observations of fauna were recorded during the vegetative surveys conducted during the December 2022 site assessment. All observed species of birds and reptiles were recorded. Birds were identified by both visual observations and through sound. Searches to detect reptiles were conducted, including under decaying tree-fall, in detritus, in crevasses, in loose soils and under loose stones, but surveys using herptile arrays were not performed.

Table 4-4. Protected Flora and Fauna Observed on the Site

Common Name	Scientific Name	Designation(s)	Abundance	Comments
Landside Plants				
Silver Thatch	*Cocothrinax argentata*	Bahamas – (Cult, Hist, Econ)	Common	Dry Broadleaf Evergreen Forest Coastal Coppice
Black Mangrove	*Avicennia germinans*	Bahamas - Cult, Hist, Econ	Uncommon	Mixed Mangrove Community
	Bursera frenningae	Bahamas – Protected IUCN - Vulnerable	Uncommon	Dry Broadleaf Evergreen Forest Coastal Coppice
Gum elemi	*Bursera simaruba*	Bahamas - Cult, Hist, Econ	Common	Dry Broadleaf Evergreen Forest Coastal Coppice
Buttonwood	*Conocarpus erectus*	Bahamas - Cult, Hist, Econ	Common	Salina edges
Sweetwood	*Croton eluteria*	Bahamas - Cult, Hist, Econ	Occasional	Costal Coppice
Tall Orchid	*Encyclia altissima*	CITES – Appendix II	Occasional	Dry Broadleaf Evergreen Forest Coastal Coppice
	Encyclia rufa	CITES – Appendix II	Occasional	Dry Broadleaf Evergreen Forest Coastal Coppice
Lignum vitae	*Guaiacum officinale*	IUCN- Endangered CITES Appendix II	Uncommon	Dry Broadleaf Evergreen Forest
Lignum vitae	*Guaiacum sanctum*	Bahamas - Protected IUCN- Near Threatened CITES Appendix II	Intermittently common	Dry Broadleaf Evergreen Forest
Blolly	*Guapira discolor*	Bahamas - Protected	Common	Dry Broadleaf Evergreen Forest
Bay Hops	*Ipomoea pes-caprae*	Bahamas - Cult, Hist, Econ	Occasional	Sand Strand
Joewood	*Jacquinia keyensis*	Bahamas - Cult, Hist, Econ	Occasional	Dry Broadleaf Evergreen Forest Coastal Coppice Sand Strand
White Mangrove	*Laguncularia racemosa*	Bahamas - Cult, Hist, Econ	Occasional	Mixed mangrove Community
	Pilocereus royenii	CITES, Appendix II	Occasional	Dry Broadleaf Shrubland

Table 4-4. Protected Flora and Fauna Observed on the Site

Common Name	Scientific Name	Designation(s)	Abundance	Comments
Buccaneer Palm	*Pseudophoenix sargentii*	Bahamas - Cult, Hist, Econ IUCN- Vulnerable	Occasional	Very few encountered
Red Mangrove	*Rhizophora mangle*	Bahamas - Cult, Hist, Econ	Common	Only in Mixed Mangrove community
Inkberry	*Scaevola plumieri*	Bahamas - Cult, Hist, Econ	Occasional	Sand Strand
Buttercups	*Turnera ulmifolia*	Bahamas - Cult, Hist, Econ	Occasional	Dry Broadleaf Evergreen Forest Coastal Coppice Sand Strand
Air Plant	*Tillandsia flexuosa*		Occasional	Dry Broadleaf Evergreen Forest Coastal Coppice
Giant Air Plant	*Tillandsia utriculata*		Occasional	Dry Broadleaf Evergreen Forest Coastal Coppice
Sea Oats	*Uniola paniculata*	Bahamas - Cult, Hist, Econ	Occasional	Sand Strand
Landside Animals				
Bahama Woodstar	*Calliphlox evelynae*	CITES, Appendix II	Occasional	Dry Broadleaf, Sand Strand
Osprey	*Pandion haliaetus*	CITES, Appendix II	Occasional	Dry Broadleaf, Sand Strand
Reddish Egret	*Egretta rufescens*	IUCN – Near Threatened	Occasional	Salinas

The absence of passable survey lines resulted in most faunal observations being conducted along existing cleared areas and at ecotone areas, which are often areas of highest diversity and abundance.

Under Bahamian Wildlife Protection Act legislation, there is no provision to formally list any species of wildlife as Endangered. Such a classification is normally assigned to migratory species under United States legislation or to assignations through scientific research on selected species such as the Bahama parrot or the Bahamian boas. Several species are protected in a special Schedule to the Act, including the Bahamian hutia (*Geocapromys ingrahami)* and the Bahamian Rock Iguana (*Cyclura* spp), neither of which were encountered.

No species listed in the First Schedule was found during the surveys. Species included in the Second Schedule that were encountered on the site include orchids (Orchidaceae), *Guaiacum sanctum*, and *Guaiacum officinale*. No species included in the Third Schedule was encountered on the site, but species included in Fourth Schedule that were observed on the site included *Bursera frenningae* and *Evolvulus squamosus*.

By default, "all other native plants and animals not included in Schedules 1, 2, 3, and 4" are included in Schedule 5, which therefore would include the floral and faunal observed (Appendix F).

No Bahamian boas (*Epicrates* spp.) or any other species of snake was observed during the survey, but suitable habitat for these species exists on the site.

All wild birds are protected under the Wild Birds Protection Act, except for species designated for hunting in a special Schedule to the Act. Species that were observed during the field investigation in December 2022 are identified in Table 4-5 and Appendix F. It is likely that additional bird surveys conducted during other times of the year would document additional species, particularly migratory birds that would be present during other times of the year.

Table 4-5. Bird Species Observed at the Site of the Proposed Calypso Cove Project during December 2022 and January 2023

Scientific Name	Common Name	Abundance	Comments
Ardea alba	Great Egret	Occasional	Only a couple sighting, in Salina and wetlands
Ardea herodias	Great Blue Heron	Uncommon	Shorelines and wetlands; could nest on the property, but infrequently observed
Arenaria interpres	Ruddy Turnstone	Common	Winter resident on beaches; observed along rocky shorelines
Butorides virescens	Green Heron	Occasional	Year-round resident; observed in Mixed Mangrove community
Calidris minutilla	Least Sandpiper	Uncommon	Fall-winter-spring resident near wetlands and shores; nests in Arctic
Calidris minutilla	Least Sandpiper	Uncommon	Encountered along rocky portions of east shoreline
Calidris sp.	Peep	Uncommon	Encountered along rocky portions of east shoreline
Calliphlox evelynae	Bahama Woodstar	Uncommon	Year-round resident; likely nests on the property
Ceryle alcyon	Belted Kingfisher	Uncommon	Fall, winter and spring non-breeding resident; only observed in Mixed Mangrove community
Charadrius semipalmatus	Semi-Palmated Plover	Uncommon	Migrant, observed along rocky shoreline
Charadrius vociferous	Killdeer	Uncommon	Year-round resident, observed along salina edges
Charadrius wilsonia	Wilson's Plover	Occasional	Summer-time resident, nests along perimeter of salt ponds and possibly on beaches
Coerba flaveola	Bananaquit	Abundant	Year-round resident likely nests on the property
Columba leucocephala	White-Crowned Pigeon	Uncommon	Year-round resident; likely nests on small offshore islands
Columba passerina	Common Ground-Dove	Common	Year-round resident; likely nests on the property
Dumetella carolinensis	Gray Catbird	Common	Fall, winter and spring resident; frequently heard
Egretta rufescens	Reddish Egret	Common	Year-round resident; often observed in Salina and Mixed Mangroves
Falco columbarius	Merlin	Uncommon	Fall, winter and spring non-breeding resident; in coppice
Fregata magnificens [1]	Magnificent Frigatebird	Uncommon	Observed over the sea; Oceanic species, year-round presence, but not likely to nest on the property
Haematopus palliatus	American Oystercatcher	Occasional	Year-round resident; observed on rocky shores

Table 4-5. Bird Species Observed at the Site of the Proposed Calypso Cove Project during December 2022 and January 2023

Scientific Name	Common Name	Abundance	Comments
Himantopus mexicanus	Black-Necked Stilt	Common	Summer-time resident, Not observed, but likely to occur
Hirundinidae	Swallow (unidentified)	Uncommon	Migratory status based on species, but did not get adequate views to ID
Loxigilla violacea violacea	Greater Antillean Bullfinch	Occasional	Year-round resident; likely nests on the property
Mimus gundlachii	Bahama Mockingbird	Occasional	Year-round resident; likely nests on the property
Mimus polyglottos	Northern Mockingbird	Occasional	Permanent resident on Long Island, may nest on the property during the summer
Pandion haliaetus	Osprey	Uncommon	Year-round resident; nest observed on rocky outcropping along south shore
Pluvialis squatarola	Black-Bellied Plover	Occasional	Winter resident; nests in northern latitudes
Rallus longirostris coryi	Clapper Rail	Uncommon	Uncommon. only heard near NW Pond, potentially nests along pond edge
Setophaga caerulescens	Black-Throated Blue Warbler	Uncommon	Fall, winter and spring resident, nests in northerly latitudes
Setophaga coronota	Yellow-Rumped Warbler	Common	Fall, winter and spring resident, nests in northerly latitudes
Setophaga discolor	Prairie Warbler	Occasional	Fall, winter and spring resident; nests in northerly latitudes
Setophaga palmarum	Palm Warbler	Common	Fall, winter and spring resident; nests in northerly latitudes
Tringa flavipes	Lesser Yellowlegs	Occasional	Winter resident; observed only in Salina east of road on south parcel
Vireo crassirostris	Thick-Billed Vireo	Common	Year-round resident; likely nests on the property
Zenaida macroura	Mourning Dove	Occasional	Year-round resident; likely nests on the property

[1] Species only observed aerially over open water

Although no white-tailed tropicbirds (*Phaethon lepturus*) were observed during the field investigation, burrows that may have been used for nesting by this species were observed on the cliffs along the south shore. Nesting season surveys for this species should be conducted, as, if confirmed to nest at these areas, seasonal closure and/or setbacks may need to be developed to prevent disturbance and nest abandonment.

4.7.2 Invasive Species

In 2003, The Bahamas Environment, Science & Technology (BEST) Commission published *The National Invasive Species Strategy for the Bahamas* (BEST, 2003). Section XVI of the publication identifies 35 plant species, 4 bird species, 17 terrestrial animal species and 19 aquatic species that were known at that time to be invasive alien species in The Bahamas. Of these, the only species that was observed during the field investigation on the subject site was *Casuarina equisetifolia* (Casuarina, Australian pine). As noted previously, *Casuarina* trees were abundant and, in some areas, were so dense that they were having an adverse impact on native plant communities.

Scaevola taccada, another species listed in The Bahamas National Invasive Species Strategy (NISS), is widespread in The Bahamas and, although it was not observed during terrestrial investigations at Calypso Cove, it is an aggressive invader. Diligence will likely be needed to prevent its establishment on the island. It will not be incorporated into landscape plantings.

4.8 Socioeconomic Aspects

4.8.1 Adjacent Communities

Clarence Town is the nearest major community to Calypso Cove and is approximately 20 miles to the north. Recent population statistics show the total population of Long Island is around 2,900 persons per the last census, with approximately 30 persons inhabiting Clarence Town. Three other smaller Settlements exist between Clarence Town and Calypso Cove and include Gordon’s Settlement directly north and adjacent to the project site, Cabbage Point Settlement approximately 5 miles to the north, and Dunmore Settlement 12 miles to the north.

4.8.2 Existing Base and Opportunities for Employment

The past economic base of south Long Island in its entirety was solely based on employment opportunities generated by the former Diamond Crystal salt plant (1965 to 1978). The plant was later repurposed as the Martiek Bahamas shrimp farm (1979 to 1984), which is now closed. This led to a depopulation of south Long Island and the immediate areas and decimated a number of small hamlets and settlements (i.e., Roses, Berries, Wallace, Miley, Hard Bargain, McKenzies and several others). Currently the only organized employment opportunities in South Long Island are two very small dry goods/grocers, one gas station, and three bars. No supply stores are in the area. Present economic activity remains subsistence farming, fishing, and construction on a reduced basis.

4.8.3 Current Land Uses

Current land uses on the site are nearly 100 percent undeveloped land, with some minor road clearing for access. There are no permanent structures on the property.

4.8.4 Existing Transportation

The southern tip of Long Island is undeveloped, so no transportation is on the site. The existing road terminates near Gordon's Settlement.

4.8.5 Existing Infrastructure and Public Services

Existing infrastructure on this portion of Long Island is non-existent. and no public services are provided.

4.8.6 Air Quality

No specific testing was accomplished to measure ambient air quality on the site. Based on present conditions and the lack of potential pollutant sources, air quality on the site is deemed to be good.

4.9 Cultural Resources

4.9.1 Historic Overview of Long Island and Vicinity

The Lucayans, indigenous people in The Bahamas, lived throughout The Bahamas archipelago Archaeological evidence of their presence is generally categorized by the size and intensity of the occupation. Living sites would have been villages or groups of households. Processing sites are those locations where it seems they gathered their catch of fish, conch, etc., to package for taking back to their village. Many of the smaller cays have these types of sites. Sacred sites would include burials in caves as well as caves used exclusively for duho (the cacique's/chief's seat) ceremonies.

More recently, the only remnants of past occupation are a clandestine runway, which was purposely built for nefarious activities in the 1980s. It has since been abandoned and is overgrown by foliage.

4.9.2 Preliminary Assessment of Cultural Resources

A historical/archeological and cultural report of the Palm Villa grave site has been commissioned. It is uncertain as to the present status because any other information about the site remains unavailable or scant. The former owners and Long Island elders seem to know very little about any other cultural or historical or heritage value of the site. It is estimated that fewer than 300 persons have visited the site in the last 50 years. Gordon's Beach has only been used by resident fishermen and tourists.

No evidence of a Lucayan presence on the island was observed, based on a partial survey of the island's coastal surface. However, based on patterns of Lucayan use and settlement throughout the Bahamian archipelago, it is not expected that such a remote area would have been used by any native residents.

Palm Villa Historical Profile is attached as Appendix K.

4.10 Existing Utility Services and Projected Capabilities

4.10.1 Water

No developed potable water supply is at the project site. There are no indications of any cisterns or other water sources.

4.10.2 Wastewater

No wastewater treatment facility is located at the project site.

4.10.3 Electricity

No electrical service is currently provided to the project site. A Bahamas Power & Light Company (BPL) line was extended to provide power to Gordon's Settlement, near the northern boundary of the subject property.

4.10.4 Roads

The existing paved road ends at Gordon's Settlement. Some other cleared paths suitable for trucks and construction equipment have been established within the project site.

4.10.5 Solid Waste

No solid waste facilities exist at the southern tip of Long Island.

5.0 Environmental Impact Analyses

This section of the report identifies possible environmental, socioeconomic, and cultural impacts that may occur as the result of the Calypso Cove project. *Impact* is defined as a change to the existing property, including the site's natural resources, environment, economic and employment conditions, property values, cultural value, etc. Both positive and negative impacts can reasonably be expected to take place either directly or indirectly as the result of the proposed project being completed. It should be noted that until the start of construction, master plan changes might occur as to include elements to mitigate potential negative impacts and improve development efficiency.

5.1 Impacts to Shoreline/Nearshore and Coastal Processes

Considerable variability and overlap exist within all habitat classifications, particularly along transition zones. For example, individual seagrass plants and/or rubble are present in some marine areas that are mapped as Sand, but generally Sand has been used for areas where the cover of other communities was less than 5 percent. Similarly, there is considerable variability within the other communities. For example, some seagrasses, macroalgae and/or corals may be present on the solid substrates within the community designated as Rubble. Within the various Coral-Dominated Communities, the abundance of corals varies considerably, often varying over very small distances, such as the difference between the side-slopes on high-relief reefs.

5.1.1 Alterations to Localized Wave Climate, Storm Surge and Storm Issues

Implementing the proposed site plan is not anticipated to cause any significant adverse impacts to the localized wave climate. The resulting impacts to the wave climate would be limited to the region adjacent to the ship berths and would not be significant. Construction of shoreline stabilization structures would also impact the wave climate, but only in areas close to the stabilization structures. These impacts would not be adverse, as the stabilization structures would be designed to provide shoreline stabilization.

The project area is prone to direct and indirect storm impacts. Some of the impacts would be storm surge, wind-waves and wave runup, and wind damage. The removal of vegetation from the island has the potential to allow more wind and sea spray to pass over the island during a storm and could result in greater storm impacts to the leeward side of the island.

5.2 Impacts to Local Circulation and Currents

The creation of the ship berthing area is expected to have little or no impact to the local circulation other than directly at the berthing pier. The pier is a trestle-type berth, so water circulation is unimpeded, also allowing fish movement between the berth and land. The width, depth and layout of the berthing area was determined based on ship simulation models that will be required to allow safe navigation and protection of the ship. Water flow between the upland and berths will be facilitated by an open structure bridge allowing water to pass (Figure 2-1). Secondary impacts to reef and seagrass communities around the berth could occur as a result of changing flow patterns, but are impossible to quantify at this time.

5.3 Terrestrial Ecology Impacts

Overlaying the proposed schematic site plan on the results of the landside vegetative community mapping has allowed the direct impacts of the proposed project to be quantified for each habitat type.

5.3.1 Utility and Support Infrastructure

Utility infrastructure requirements include the RO potable water production plant, the WWTP, the solid waste management facility, electrical facilities, maintenance areas, and an administrative complex may be included in Phase 2. Conceptual site plans for these facilities will require impacts in the north parcel, most of which is Dry Broadleaf Evergreen Forest. This area will be covered under a separate EIA.

5.3.2 Landside Ecology Impact Summary

Acreage calculations for all landside habitats (e.g., Upland, Human-Altered) are based on overlaying the proposed site plan on the results of the landside community mapping (Figure 5-1).

Table 5-1 identifies the area of each habitat that will be impacted by the proposed construction, followed by descriptions of the impacts to each vegetative community.

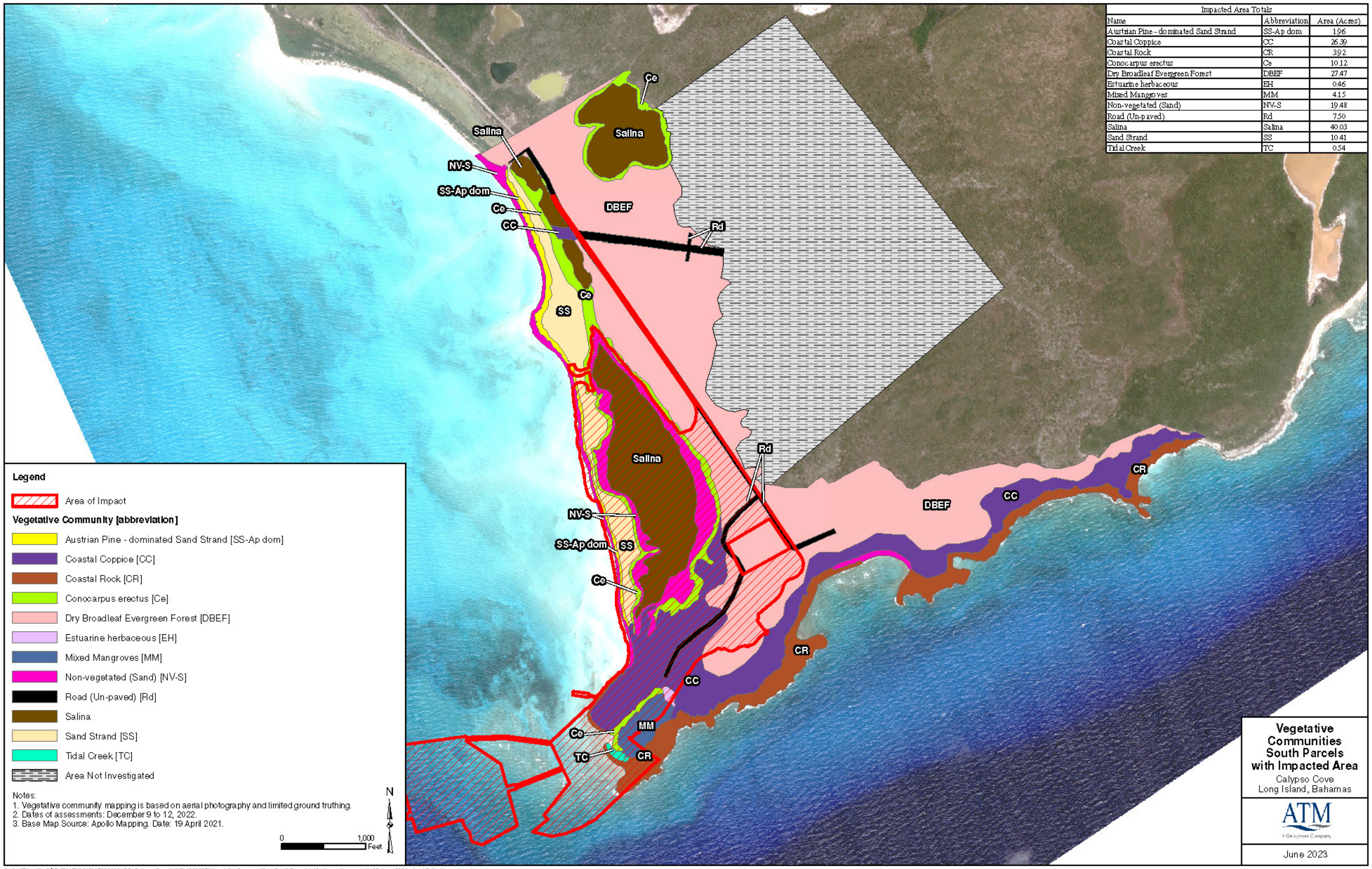


Figure 5-1. Vegetative Communities South Parcels with Impact Areas

Table 5-1. Direct Impacts on Landside Communities

	Pre-Development Area		Area Impacted		Post-Development Area Remaining	
Vegetative Community	Acres	% of Total Area	Acres	% Impact to Community	Acres	%
Upland Habitats						
Dry Broadleaf Evergreen Forest	189.94	26.12	27.47	14.5	162.47	85.5
Coastal Coppice	66.45	9.14	26.39	39.7	40.06	60.3
Sand Strand	22.69	3.12	10.40	45.8	12.29	54.2
Australian Pine Dominated Sand Strand	5.51	0.76	1.96	35.6	3.55	64.4
Coastal Rock	32.52	4.47	3.92	12.0	28.6	88
Non-Vegetated						
Sandy Beach	25.41	3.12	19.48	76.6	5.93	23.4
Area Not Assessed	275.7	37.91	0	0		
Wetland Habitats						
Tidal Creek	0.54	0.07	0.54	100	0	0
Mixed Mangroves	5.18	0.78	5.18	80.3	0	0
Conocarpus erectus	22.27	3.06	10.12	45.4	12.15	54.6
Salinas	63.73	8.76	40.03	62.8	53.7	37.2
Estuarine Herbaceous	0.53	0.07	0.46	86.8	0.07	13.2
Human Altered Areas						
Roads, Unpaved and Rock Walls	16.28	2.24	7.50	44.7	8.78	55.3
Total	726.75	99.62	152.43	20.91	328.62	45.22

5.3.2.1 Direct and Indirect Impacts to the Dry Broadleaf Evergreen Forest (DBEF)

DBEF is the most abundant vegetative community type within the project boundaries and, as such, it will also be the terrestrial community that is most impacted by the proposed project. Direct impacts will include the clearing of land for construction of the visitor use areas and the network of roads and infrastructure necessary to support these facilities. One hundred ninety acres of this community are expected to be impacted. This includes areas where the existing canopy may remain, but sub-canopy and/or groundcover vegetation will be affected.

Indirect Impacts will occur when the clearing of DBEF allows further penetration of salt spray and wave runup during period of heavy seas. Trees that are currently protected from salt spray will be more vulnerable when the vegetation that shields them is removed. Indirect impacts also include a shift in the ability of the DBEF community to provide habitat for some bird and other wildlife species. Specialist species that require mostly undisturbed native habitat (e.g., white-crowned pigeon, merlin, Bahama mockingbird) are likely to decline in abundance. Generalist species, particularly those that thrive in urban areas (e.g., bananaquits, northern mockingbirds, mourning doves) are likely to increase in abundance and spatial extent.

5.3.2.2 Direct and Indirect Impacts to the Coastal Coppice Community

Direct Impacts to this community will occur through the land clearing and construction of visitor use experience areas. The changes described in the DBEF community are also likely to occur in this community. Additionally, unless otherwise salvaged prior to initiating land clearing, populations of minimally motile organisms (e.g., *Cerion* and *Hemitrochus* snails) will be reduced.

As identified in Section 5.4.2.1, secondary and indirect impacts to DBEF Coastal Coppice could also occur in areas where land clearing along the shore allows sea spray to penetrate further into the coastal coppice community than it presently does.

5.3.2.3 Direct and Indirect Impacts to the Sand Strand Community

Most of the existing Sand Strand community will be impacted to create the waterfront visitor use areas on the west side of the project site. Various areas will be altered to create visitor use areas. Other areas of Sand Strand will be excavated to create water attraction areas.

Indirect impacts of development in this area include its diminished resilience to sea level rise and protection from potential storm surge that will occur as a result in the removal of native vegetation to create resort amenities, however this reduction will be offset by the development and potential future implementation of an emergency preparedness plan.

5.3.2.4 Direct and Indirect Impacts to Australian Pine Dominated Sand Strand

All of the Australian Pine Dominated Sand Strand will be impacted, as the Australian pines are an undesirable, invasive exotic. Trees will be cleared and likely be burned, although some wood may be salvaged for artisanal crafts.

Plant diversity and resilience to sea level rise and protection from storm surge will be enhanced through the removal of the storm-vulnerable Australian pines and replacement with landscape species.

5.3.2.5 Direct and Indirect Impacts to Coastal Rock

The majority of this feature occurs on the east side of the project and will remain intact and unaltered. A variable-width setback of 10 to 50 ft (3 to 15 m) from MHW to the nearest project components has been designed to minimize impacts to this community, which will also prevent disturbance to intertidal flora and fauna, the osprey nest, and other potential bird nesting habitats that the Coastal Rock community currently supports.

The portion of Coastal Rock in the intertidal zone on the west side of the project will likely be removed to provide safe swimming conditions for future visitors.

5.3.2.6 Direct and Indirect Impacts to Unvegetated Sandy Beaches

All of this community will be impacted, either through excavation of channels into water recreation areas or through increased human use. Impacts are mostly adverse, but through the development and implementation of a routine beach cleanup programme, the accumulation of flotsam, jetsam and other current-deposited debris will be removed from the site and appropriately disposed.

5.3.3 Impacts to Wetlands

5.3.3.1 Direct and Indirect Impacts to the Tidal Creek

The proposed site plan calls for this area to be filled.

5.3.3.2 Direct and Indirect Impacts to Mixed Mangrove Community

The proposed site plan calls for this area to be filled.

Indirect impacts associated with the loss of this habitat will be the elimination of habitat for wading birds, and other migratory and resident birds and wildlife.

5.3.3.3 Direct and Indirect Impacts to the *Conocarpus erectus* Community

Most of this community is present along the perimeter of the salinas. Because the largest salina is proposed to be converted into swimmable blue-water features, much of the buttonwood community in the large salina will be converted to other uses.

No impacts are proposed in the portions of this community that are present adjacent to the north salina (west of the access road) and around the salina east of the road at the north property line, both of which are to remain in their current condition.

5.3.3.4 Direct and Indirect Impacts to the Salinas

Of the three salinas that are present within the boundary of Phase I of the project, no impacts are proposed to the two northern most ponds at this time.

Existing sediments are proposed to be removed from the southernmost pond, clean sand will be brought in to create a sandy bottom, and water quality will be improved by providing two tidal connections to sea. For most floral, faunal and marine species, this conversion will be a net improvement, transforming this hypersaline pond into a more productive marine habitat. Marine life, including juvenile reef-fish, are likely to colonize the area soon after hypersaline conditions are eliminated. Conversely, the elimination of more than 40 acres of this habitat is likely to have an adverse impact on the specialized suite of organisms that depend on this habitat (e.g., brine shrimps, flamingos, black-necked stilts etc.)

A full flushing study for the pond is attached as Appendix J.

5.3.4 Human Altered Areas

5.3.4.1 Direct and Indirect Impacts to Existing Unpaved Roads

The existing roads will be improved as the primary transportation corridors through the site. While this will result in an increase in impervious area, they will be designed to capture road runoff and prevent it from having adverse impacts on adjoining areas.

5.3.4.2 Direct and Indirect Impacts to the Rock Walls

The existing rock walls are of cultural significance and will be left intact.

5.4 Impacts to Surface Water and Ground Water Quality

Potential impacts to surface water quality due to the development of Calypso Cove may come from the following sources:

- Short-term impacts during excavation, dredging, and construction
- Buildup of pollutants within the basin and subsequent export to offshore waters
- Leaching and runoff of nutrients and pesticides from areas to be developed
- Impacts from RO concentrate discharged into deep water at the pier
- Connection of the salina to the open water and induced circulation in the basin

The following sections outline the potential levels of impact from these sources, along with discussion of BMPs that will minimize impacts to surface and ground water quality.

5.4.1 Construction Impacts

Potential impacts due to construction will be short term and limited through implementation of site-specific controls. Proposed construction involves the dredging of the cruise ship berth, creation of the pier landing trestle and partially landfilling the southern tip. Suspended sediment impacts to the nearby waters are always a concern when construction activities occur near surface waters. Dredging and filling will be conducted in compliance with the EMP and other BMPs that will be described in the EMP. Standard practices to eliminate turbidity will be employed during construction, with turbidity curtains utilized where appropriate.

A heavy-duty siltation curtain designed for fast or rough water conditions will be utilized. Trained staff will work onsite and directly with the contractors to observe the installation of turbidity curtains and resolve anchoring issues. The following activities will be done in conjunction with the installation of the curtains.

- Visual in-water inspections of the installed curtains will be made and corrective measures enforced for deficiencies found.
- Traditional as well as innovative anchoring systems will be employed, including combinations of Danforth anchors and fabricated concrete/rebar blocks.

These practices have proven successful in limiting movement of silt outside of the construction area. Detailed methodologies and operations for reductions of turbidity issues during construction will be outlined within the EMP.

Active upland clearing and construction areas will be surrounded by erosion control barriers that will control runoff to adjacent areas. For any given construction area, these barriers will be placed prior to the start of clearing and remain in place through the completion of construction and site stabilization. Pile driving for the piers is expected to produce minimal suspended sediment and, therefore, minimal impacts are expected. Details on upland controls will be outlined within the EMP.

5.4.2 Stormwater Impacts

Stormwater runoff from roads and other impervious surfaces that are proposed to be constructed on Calypso Cove will be handled in such a manner as to provide sedimentation and water quality treatment.

5.4.3 Reverse Osmosis Effluent

After brackish water is desalinated through the RO process, the salt and minerals that are filtered from the remaining concentrate must be disposed.

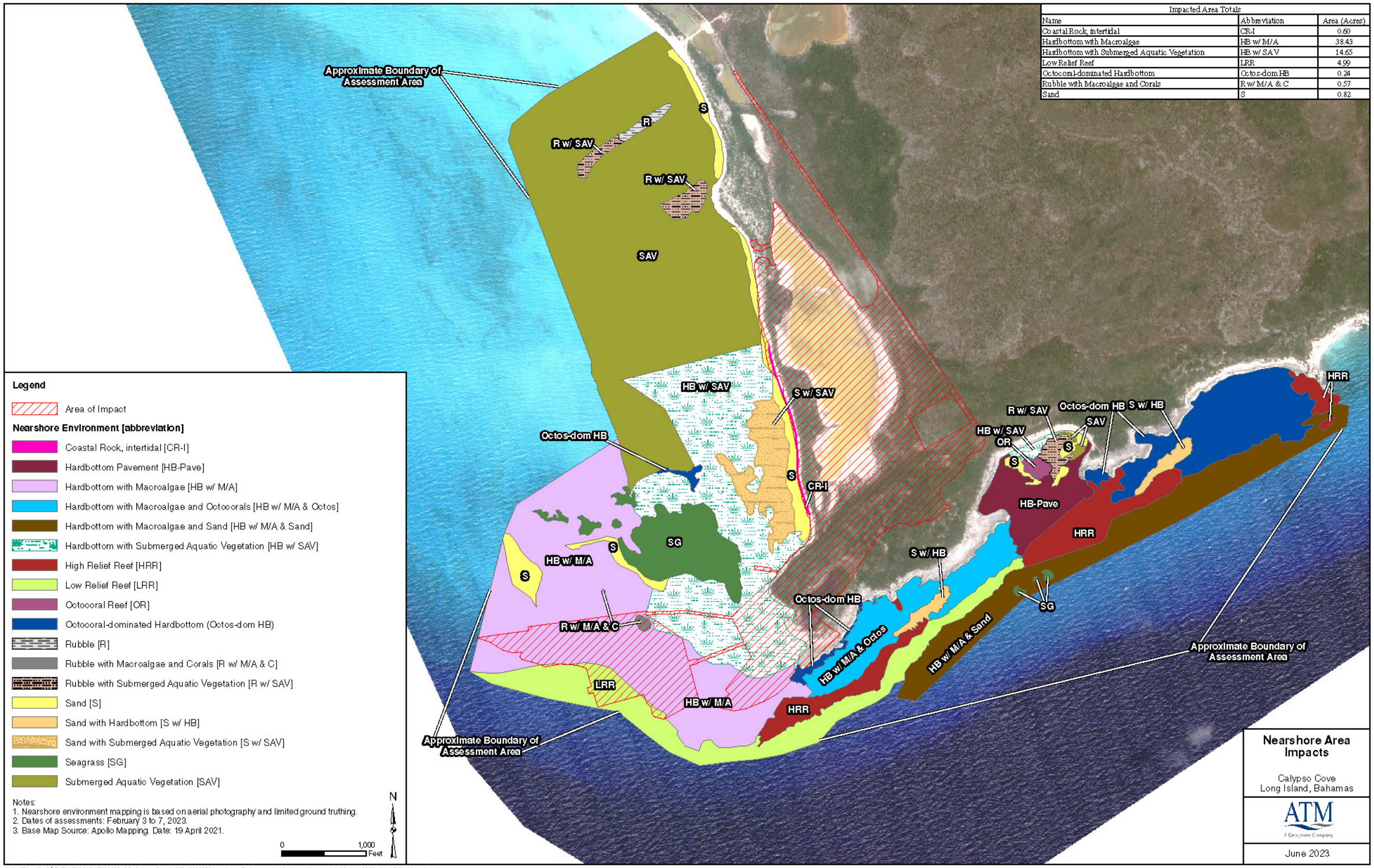
The two most common options for concentrate disposal are deep well injection and direct discharge to surface water. For this project, offshore disposal to deep water will be utilized due to the relative short distance to the deep, well-mixed waters of the open ocean and Crooked Island Passage. The pretreatment of source waters and the efficiency of the membranes will remove most pollutants before any discharge takes place. The discharging of remaining pollutants is not expected to adversely impact the environment due to dilution and dynamic flushing by the receiving waters.

5.5 Marine Ecology Impacts

Several aspects of the proposed project have the potential to adversely affect the surrounding marine environment, both during construction and ultimately during operation for the life of the facility. These include both direct and indirect impacts from dredging, filling, construction at the cruise ship berthing area, the transformation of the existing west shoreline into recreational use areas, and creation of a visitor use area on Folley Bay. Figure 5-2 shows the impact areas from the development, mostly related to the berthing area.

Less direct impacts, but equally important issues, are those impacts derived from land-based activities that can filter into the marine environment. These impacts may occur during the short-term construction phase or the longer-term operation of the facility. Because most of the existing property is in an undeveloped state, the marine environment may be particularly susceptible to modifications on the landside of the project, particularly where environmentally sensitive resources exist immediately adjacent to mean high water.

This section describes the expected direct and Indirect impacts to marine habitats within the estimate sphere of influence of the proposed project. Anticipated direct and indirect impacts to each mapped marine community are identified in Table 5-2 and described individually thereafter. Acreage calculations to each marine habitat are based on overlaying the proposed site plan on the results of marine habitat mapping.



Impacted Area Totals		
Name	Abbreviation	Area (Acres)
Coastal Rock, intertidal	CR-I	0.60
Hardbottom with Macroalgae	HB w/ M/A	38.43
Hardbottom with Submerged Aquatic Vegetation	HB w/ SAV	14.65
Low Relief Reef	LRR	4.99
Octocoral-dominated Hardbottom	Octos-dom HB	0.24
Rubble with Macroalgae and Corals	R w/ M/A & C	0.57
Sand	S	0.82

Figure 5-2. Nearshore Area Impacts

Table 5-2. Direct Impacts on Marine Communities

Marine Community	Direct Impact Area (acres)
Coastal Rock – Intertidal	0.60
Hardbottom with Macroalgae	38.43
Octocoral-Dominated Hardbottom	0.24
Hardbottom with Submerged Aquatic Vegetation	14.65
Low-Relief Reef	4.99
Rubble with Macroalgae and Corals	0.57
Sand	0.82
Total:	60.3

5.5.1 Direct and Indirect Impacts to Hardbottom Pavement

Construction and operation of the proposed project is not expected to have any direct impacts on this habitat. Indirect impacts may occur as a result of runoff from adjacent uplands that are proposed to be developed and increased use of the nearshore area by future visitors (e.g., snorkelers, effects of the use of non-reef safe sunscreen, etc.)

5.5.2 Direct and Indirect Impacts to Hardbottom with Macroalgae

Approximately 38 acres of Hardbottom with Macroalgae will be impacted due to the dredging footprint plan. The footprint will create deeper waters that will continuously be impacted by ship presence and the dredged bottom.

Secondary impacts may occur as a result of temporarily suspended sediments during use of bow and/or stern thrusters as ships navigate into and out of the berths.

5.5.3 Direct and Indirect Impacts to Hardbottom with Macro-algae and Octocorals

Construction and operation of the proposed project is not expected to have any direct impacts on this habitat. Indirect impacts may occur as a result of runoff from adjacent uplands that are proposed to be developed and increased use of the nearshore area by future visitors (e.g., snorkelers, effects of use of non-reef safe sunscreen, etc.)

5.5.4 Direct and Indirect Impacts to Hardbottom with Macroalgae and Sand

Construction and operation of the proposed project is not expected to have any direct impacts on this habitat. Secondary impacts may occur as a result of deposition of temporarily suspended sediments from the use of bow and/or stern thrusters as ships navigate into and out of the berths during out-going times of the tidal cycle.

5.5.5 Direct and Indirect Impacts to Octocoral-Dominated Hardbottom

Construction and operation of the proposed project is expected to directly impact 0.24 acres of this habitat that will be filled. Additional indirect impacts may occur as a result of runoff from adjacent uplands that are proposed to be developed and increased use of this nearshore area by future visitors (e.g., snorkelers, effects of use of non-reef safe sunscreen, etc.). Secondary impacts could occur as a result of deposition of temporarily suspended sediments from the use of bow and/or stern thrusters as ships navigate into and out of the berths during out-going times of the tidal cycle.

5.5.6 Direct and Indirect Impacts to Hardbottom with Submerged Aquatic Vegetation

Approximately 14.6 acres of Hardbottom with Submerged Aquatic Vegetation will be directly impacted, mostly due to filling at the southern tip of the project to create needed upland.

Indirect impacts may occur as a result of runoff from adjacent uplands that are proposed to be developed and increased use of the nearshore area by future visitors (e.g., snorkelers, effects of use of non-reef safe sunscreen, etc.). Secondary impacts could occur as a result of deposition of temporarily suspended sediments from the use of bow and/or stern thrusters as ships navigate into and out of the berths during incoming times of the tidal cycle.

5.5.7 Direct and Indirect Impacts to High-Relief Reef

Construction and operation of the proposed project is not expected to have any direct impact on this habitat. Indirect impacts may occur as a result of runoff from adjacent uplands that are proposed to be developed. Secondary impacts could occur as a result of deposition of temporarily suspended sediments from the use of bow and/or stern thrusters as ships navigate into and out of the berths during outgoing times of the tidal cycle.

5.5.8 Direct and Indirect Impacts to Low-Relief Reef

Approximately 5 acres of Low-Relief Reef will be impacted, mostly due to the dredging footprint required for the ship berth.

Indirect impacts may occur as a result of runoff from adjacent uplands that are proposed to be developed. Secondary impacts could occur as a result of deposition of temporarily suspended sediments from the use of bow and/or stern thrusters as ships navigate into and out of the berths during incoming and outgoing times of the tidal cycle.

5.5.9 Direct and Indirect Impacts to Octocoral Reef

Construction and operation of the proposed project is not expected to have any direct impacts on this habitat. Indirect impacts may occur as a result of runoff from adjacent uplands that are proposed to be developed and increased use of the nearshore area by future visitors (e.g., snorkelers, effects of use of non-reef safe sunscreen, etc.).

5.5.10 Direct and Indirect Impacts to Rubble

Construction and operation of the proposed project is not expected to have any direct impacts on this habitat. Indirect impacts may occur as a result of runoff from adjacent uplands that are proposed to be developed and increased use of the nearshore area by future visitors (e.g., snorkelers, effects of use of non-reef safe sunscreen, etc.).

5.5.11 Direct and Indirect Impacts to Rubble with Macroalgae and Corals

Construction and operation of the proposed project is not expected to have any direct impacts on this habitat. Indirect impacts may occur as a result of runoff from adjacent uplands that are proposed to be developed and increased use of the area by future visitors (e.g., snorkelers, effects of use of non-reef safe sunscreen, etc.). Secondary impacts could occur as a result of deposition of temporarily suspended sediments from the use of bow and/or stern thrusters as ships navigate into and out of the berths during incoming times of the tidal cycle.

5.5.12 Direct and Indirect Impacts to Rubble with Submerged Aquatic Vegetation

Construction and operation of the proposed project is not expected to have any direct impacts on this habitat. Indirect impacts may occur as a result of runoff from adjacent uplands that are proposed to be developed and increased use of the nearshore area by future visitors (e.g., snorkelers, effects of use of non-reef safe sunscreen, etc.).

5.5.13 Direct and Indirect Impacts to Sand

Construction and operation of the proposed project is not expected to have any direct impacts on this habitat. Indirect impacts may occur as a result of runoff from adjacent uplands that are proposed to be developed and increased use of the nearshore area by future visitors (e.g., snorkelers, effects of use of non-reef safe sunscreen, etc.).

5.5.14 Direct and Indirect Impacts to Sand with Hardbottom

Construction and operation of the proposed project is not expected to have any direct impacts on this habitat. Indirect impacts may occur as a result of runoff from adjacent uplands that are proposed to be developed and increased use of the area by future visitors (e.g., snorkelers, effects of use of non-reef safe sunscreen, etc.). Secondary impacts could occur as a result of deposition of temporarily suspended sediments from the use of bow and/or stern thrusters as ships navigate into and out of the berths during outgoing times of the tidal cycle.

5.5.15 Direct and Indirect Impacts to Sand with SAV

Construction and operation of the proposed project is not expected to have any direct impacts on this habitat. Indirect impacts may occur as a result of runoff from adjacent uplands that are proposed to be developed and increased use of the area by future visitors (e.g., snorkelers, effects of use of non-reef safe sunscreen, etc.). Secondary impacts could occur as a result of deposition of temporarily suspended sediments from the use of bow and/or stern thrusters as ships navigate into and out of the berths during in-coming times of the tidal cycle.

5.5.16 Direct and Indirect Impacts to Seagrass

Construction and operation of the proposed project is not expected to have any direct impacts on this habitat. Indirect impacts may occur as a result of runoff from uplands that are proposed to be developed and increased use of the nearshore area by future visitors (e.g., snorkelers, effects of use of non-reef safe sunscreen, etc.). Secondary impacts could occur as a result of deposition of temporarily suspended sediments from the use of bow and/or stern thrusters as ships navigate into and out of the berths during incoming times of the tidal cycle.

5.5.17 Direct and Indirect Impacts to Submerged Aquatic Vegetation

Construction and operation of the proposed project is not expected to have any direct impacts on this habitat. Indirect impacts may occur as a result of runoff from uplands that are proposed to be developed and increased use of the nearshore area by future visitors (e.g., snorkelers, effects of use of non-reef safe sunscreen, etc.)

Elevated turbidity and sedimentation are expected during the construction of the vessel berths but will be minimized through implementation of the sediment control specifications in the EMP.

Turbidity, siltation and sedimentation can be detrimental to the growth and survival of coral reef organisms, particularly filter-feeding organisms such as brachiopods, bryozoans, crinoids, and sponges. Turbidity impacts can lead to chronic perturbations that cause long-term reductions in primary and secondary productivity of coral reef communities by reducing the amount of light available for photosynthesis. Most effects of sedimentation upon stony corals are sublethal, causing excessive mucous production and increased respiration rates (Porter and Tougas, 2001; Rogers, 1990). Depending upon the species and life stage, direct mortality can result if the sedimentation load is excessive or if sediments accumulate in depressions of large, massive colonies, causing tissue death. Stony coral recruitment can also be negatively affected by sedimentation through increased mortality of juvenile corals and reduced larval settlement rates (Rogers, 1990).

5.5.18 Potential Impacts to Endangered Species, Threatened Species, Endemic Species and Other Species of Interest

As identified in previous sections, various species that are designated for protection by the Government of The Bahamas and/or other international treaties have been found to occur within the project area and, therefore, have the potential to be adversely affected during the construction and/or operation of the proposed facility. The EMP and the Proposed Mitigation Measures (Section 6) will include recommendations to minimize the potential for adverse impacts to these species and recommendations for mitigating for unavoidable impacts.

In addition to those Endangered, Threatened and Endemic species, the project has the potential to adversely affect Other Species of Interest, including bonefish, grouper, and whales, as described hereafter.

Reports of use of the area in pre-spawning aggregations (Dahlgren et al. (2016), Adams et. al, (2019)) and personal communication with individuals with first-hand knowledge of this area corroborate observations of existing conditions in the marine environment that suggest that portions of the project area may be important pre-spawning aggregation areas for grouper and bonefish. Published reports on this subject intentionally do not include detailed maps and specifics. However, the location of the project site at the southern terminus of miles of suitable habitat, coupled with the proximity to nearshore deep water, suggest that the area may be important for these Other Species of Interest.

To reduce potential adverse impacts to these species, the proposed site plan for development near the proposed vessel berthing area and visitor disembarkation infrastructure has been modified to create a fish crossing corridor. The accessway for passenger ingress and egress between the ship(s) and the land will be via an elevated pier, which will allow fish to pass from north to south and south to north in this area when ship(s) are at port.

While not attributable to any specific benthic community, the navigation of cruise ships is likely to adversely affect marine mammals. Direct impacts may arise through potential direct vessel strikes, although the potential for this to occur is minimal. A greater potential impact is noise, as marine mammals, and whales in particular, are sensitive to noise emanating from large vessels. A site-specific study of whale migration/movement corridors in the vicinity of the proposed project has not been performed.

5.6 Air Quality Impacts

Long-term emission levels are expected to be insignificant throughout the life of the project, since land use will consist of mostly day-use facilities and limited housing for employees. Point source emissions on the project site are likely to originate from automobiles, boats, maintenance equipment, ship exhaust when in port, etc. These small sources of pollution are unlikely to generate significant emission levels, which are typical of residential and commercial development projects.

5.7 Impacts to Utilities and Local Infrastructure

Currently, the project site is undeveloped with no local infrastructure. The following sections outline the infrastructure and utilities to be constructed on or provided to the Calypso Cove development. The impacts of the utility needs are also summarized.

5.7.1 Electricity

Electrical power at Calypso Cove will be provided by a combination of diesel generators, solar and wind power, and supplemental power from BPL.

5.7.2 Water

Potable water will be produced at Calypso Cove by RO system units and freshwater/reuse storage tanks.

5.7.3 Wastewater

Wastewater generated at Calypso Cove will be collected via a central sewer system that will include lift stations to pump through forced mains, a treatment plant, and a surge tank.

5.8 Socioeconomic Impacts

5.8.1 Land Use Impacts

Section 4.8.4 provides a baseline description of existing land uses. Once completed, the site will be a fully self-sufficient day destination for cruise ship passengers.

5.8.2 Impacts on Neighboring Communities

The Calypso Cove project will have negligible negative impacts upon the neighboring communities on Long Island. The project will provide significant positive impacts to these communities through increased employment opportunities and additional revenue based upon increases in tourism-related activity.

5.8.3 Relocation Impacts

No relocation impacts will result from this project as there are no existing residents within the project area.

5.8.4 Traffic Impacts

The Calypso Cove development will increase the potential number of visitors traveling through Long Island, including Clarence Town and the neighboring settlements. The projected increases would only be related to day excursion for cruise passengers and not adversely impact potential traffic conditions in these areas.

5.8.5 Economic/Employment Impacts

Calypso Cove is located in a remote area of Long Island with very few inhabitants and extremely limited economic opportunities (Sections 3.3.2 and 4.8.2). This project will increase both the population and economic activity through direct and indirect impacts with the project and its service providers/subcontractors and the community. Additionally, certain public infrastructure will be necessary for the resident and transitory workers, namely, housing, utilities and general population support services (i.e., schools, vocational training, professionals and tradesman). Calypso Cove may become a positive regenerative engine for this area of Long Island area, with little or no socioeconomic or cultural disadvantage. It should be noted that this project will be the first large scale project providing employment in the Southern Bahamas since the inception of Morton Salt on Inagua.

5.8.6 Aesthetic and Visual Impacts

The Calypso Cove project is designed to blend with the natural beauty and scenery of the island. The goal is to retain, as much as possible, the present tropical nature of the island while providing the amenities and associated components of the destination. This commitment to retaining the natural feel can be seen in the development of the salina lagoon snorkeling area and beaches.

In keeping with the creation of a quiet island atmosphere, natural vegetation will be used to help demark the usage areas on the project. The architectural design of the buildings will be complementary to the surroundings. Landscaping will be used to screen the caretaker and service areas from view, while keeping them accessible to maintenance personnel.

5.9 Cultural Resource Impacts

Cultural resource studies for archeological and historical resources are currently being undertaken. While no additional impacts are anticipated, any new information or discoveries during construction will be addressed under the EMP.

6.0 Proposed Mitigation Measures

Even with conscientious design, construction and management, the replacement of vacant land with the proposed infrastructure will result in unavoidable environmental impacts. To mitigate for these impacts, the following comprehensive environmental mitigation program has been developed. It will consist of the following variety of landside and marine initiatives.

1. Removal and Management of Invasive Species

   Invasive species are recognized as a serious threat to biodiversity. Without the natural controls that keep their populations in check in their natural habitats, invasive species can often out-compete native species and may create monocultures, as has happened with the Australian pines along most of the west-facing shore of the project area.

   a. Landside Invasives

      An initial removal of *Casuarina* trees and any other land-based species listed in the NISS will be conducted through a two-step process. Areas within the development footprint (i.e., existing *Casuarina*-dominated backdune areas) will be the first priority. Removal of *Casuarina* and other NISS-designated invasives that are in remote areas that will not otherwise be impacted by site development will be the second priority. Management of invasive species through ongoing maintenance programs will be undertaken to prevent recolonization after initial treatment/removal. Periodic removal of new recruits will prevent re-establishment of NISS-designated invasives.

   b. Marine Invasives

      Although the invasive species listed in the NISS were designated before lionfish became a problem, in recent years, increasing populations of lionfish in The Bahamas, Florida and the Caribbean have been documented to be having adverse impacts on populations of native fish. Lionfish were not observed during the marine assessment, but may be present. The Developer will work with the local community and the Government of The Bahamas to support a lionfish management program.

2. Solid Waste Removal

   Flotsam, jetsam, and various other debris (some of which may have been deposited by winds associated with Hurricane Juaquin) are abundant along the shore of the project, including in Folley Bay. This accumulation of debris and litter presents the potential for transfer into the marine environment. Waste will be removed across the entirety of the project site and deposited at an appropriate waste facility. An ongoing waste management program will provide adequate refuse collection points and continued monitoring of shoreline for marine debris washed ashore.

In the marine environment, abandoned fishing gear (e.g., anchor lines, nets, fish traps etc.) and the remnants of sunken boats (which, in at least one situation, included corroding batteries) were encountered within the project area. This debris will be removed from the marine environment and be disposed at an appropriate upland facility.

3. Due to the extensive seagrass and SAV shallows on the west side of the site, the increase in boating activity that will result from development of the project will increase the likelihood of damage to benthic resources through anchoring and propeller dredging in shallow areas.

   Mooring buoys will be installed at appropriate locations around the nearshore coastal environment to help prevent indiscriminate anchoring on reefs and other fragile benthic habitats, particularly at areas that are likely to be repeatedly used for snorkeling (and/or scuba diving). The Developer will work with the local community and the Government of The Bahamas to determine if installation of navigation aids (e.g., channel markers) may help reduce the potential for damage to benthic resources.

4. Mitigation for Unavoidable Impacts to Marine Resources
   To mitigate for unavoidable impacts to marine resources in the proposed ship berthing area, a comprehensive marine mitigation initiative is proposed. The program may include direct actions (e.g., relocation of notable stony corals that are 10 cm or more in diameter and are present within the proposed impact areas), and support to others for marine education, research, and conservation of coral and other marine resources. Details of the program will be developed in coordination with the Government of The Bahamas. Program elements under consideration include the following:

a. Coral relocation/restoration, including potential creation of artificial reef habitats;
b. Support to non-governmental organizations for ongoing or new marine education and conservation programs;
c. Support to the Government of The Bahamas and/or The Bahamas National Trust to help achieve their mission to enhance the existing network of Marine Protected Areas throughout the archipelago;
d. Onsite interpretive signage and environmental programs for staff and visitors; and
e. Support to develop or expand community conservation education programs, including sustainable fisheries.

5. Guest Education Programs.
   Onsite interpretive educational programs will be offered for guests and employees at the site. The educational programs will highlight the species found in Bahamian terrestrial and marine environments, especially on Long Island.

6. Community Outreach and Improvements.
   Outreach to the greater community of Long Island through stakeholder consultation will explore opportunities to support programs for the preservation and conservation of historic places and cultural heritage. Community investment in cultural heritage preserves a sense of place and highlights the unique participation of the Exumas to the history of The Bahamas.

7. Environmental Management Plan.
   An EMP with a monitoring program will be implemented to guide construction, with employment of BMPs and techniques to control erosion and sediments impacts associated with construction activities.

7.0 Environmental Management Plan

A detailed EMP will be submitted under separate cover and will include specific details regarding project construction, monitoring, and mitigation. The EMP will ensure that the development of the Calypso Cove project proceeds with adequate controls that protect the long-term health of the environmental resources of the project site and immediate vicinity.

Items to be covered under the EMP will include, but not limited to:

1. Construction planning
2. Upland best management practices
3. Best management practices for the marinas and berthing area
4. Construction safety issues
5. Methods for berthing basin construction
6. Marina operations
7. Cultural resources
8. Sediment and erosion control measures
9. Construction materials and fill spoils storage
10. Measure for protection of sensitive environmental features
11. The environmental monitoring program
12. Emergency response plans
13. Details on proposed mitigation efforts

8.0 Public Consultation and Environmental Law Summary

Public consultation for the proposed development will occur at the discretion of the Government of The Bahamas. Consultation with local stakeholders including the local Member of Parliament is encouraged to facilitate transparency, communication, participation and buy-in on project components. The venue and time shall be coordinated between the developer and the Government of The Bahamas. Some preliminary correspondence and a visit by DEPP has been conducted at the time of this EIA document.

Appendix G provides a summary of the legal and regulatory policies and conventions for the Government of The Bahamas.

9.0 Conclusions

To prepare this EIA document, extensive studies were conducted addressing infrastructure and utility requirements, water quality, coastal erosion and stabilization, and terrestrial and marine ecological impacts. The proposed site was selected based on the proximity to water deep enough to reduce dredging of the marine waters and eliminate unnecessary impacts.

Excavation of existing sediments in the large salina and conversion of its condition from a land-locked, hypersaline feature to a viable marine habitat will be a net improvement to the marine environment overall, and will serve as a mitigation effort.

The creation of a fish movement corridor between the shore and the proposed cruise ship berths will minimize adverse impacts on pre-spawning aggregations of bonefish, grouper and other species that may similarly move from the nearshore waters along both sides of Long Island to deep water.

Nearshore reefs along the eastern side of the project area shoreline away from the development areas of the project have a high degree of environmental value and sensitivity, including species that are suffering from coral bleaching in many other areas of The Bahamas and the Caribbean. Construction and long-term operation of the Calypso Cove project have the potential to have adverse impacts on noteworthy corals, even though no elkhorn or staghorn were encountered during the natural resource surveys. A detailed EMP will be developed and implemented and the mitigation strategies identified will be conscientiously implemented so that the project can be completed with a minimal net adverse impact on the marine environment.

Similarly, much of the landside portion of the property consists of terrestrial habitats that are in a fairly healthy condition. Care will be taken to prevent or minimize adverse ecological impacts on endemic, endangered and/or notable plants. As part of the project, micro-siting or strategic placement of buildings and structures will be done to preserve notable species (e.g., Lignum vitae) in their original location as amenities around proposed visitor use areas so that they will not be impacted.

Due to the presence of lignum vitae and other protected trees in areas that are proposed for development, a permit will need to be obtained from the Forestry Department prior to the initiation of site clearing. Additional field investigations will need to be completed to apply for this permit. Once those surveys and mapping of forest resources are completed, a detailed mitigation plan will be developed.

Provided a forestry permit (with mitigation) is obtained, endemic and/or notable plants are salvaged and relocated for integration into the landscape and the proposed BMPs are followed regarding protection of marine resources, the project can be constructed and operated in a manner that will have minimal net adverse impact on the environment. BMPs would include a site-specific study to determine, identify and implement countermeasures to prevent adverse impacts on whales, pre-spawning aggregations of bonefish, grouper, and other marine resources,

Additionally, water management systems will be conscientiously engineered and implemented, therefore, the project can be built and operated without having significant adverse ecological impacts.

Through thoughtful planning, attention to detail during construction, conscientious implementation of recommendations in the EMP and mitigation, the Calypso Cove project can become a key element of the Long Island experience that will benefit existing and future residents of Long Island and be an enduring asset to The Bahamas.

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Appendix A

Coastal Engineering Study Report

LONG ISLAND CRUISE DEVELOPMENT

LONG ISLAND
BAHAMAS

COASTAL ENGINEERING STUDY REPORT

JULY 22, 2022

PREPARED BY

OCEANSIDESOLUTIONS

PREPARED FOR

AMERICAN GUARD SERVICES, INC.
1125 WEST 190TH STREET
GARDENA, CA 90248

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1. INTRODUCTION

Oceanside Solutions LLC (Oceanside) was authorized to conduct a coastal engineering study for a potential cruise terminal project site located at the south end of the Long Island, Bahamas (Latitude 22°51'N, Longitude 74°51'W, see Figure 1.1).

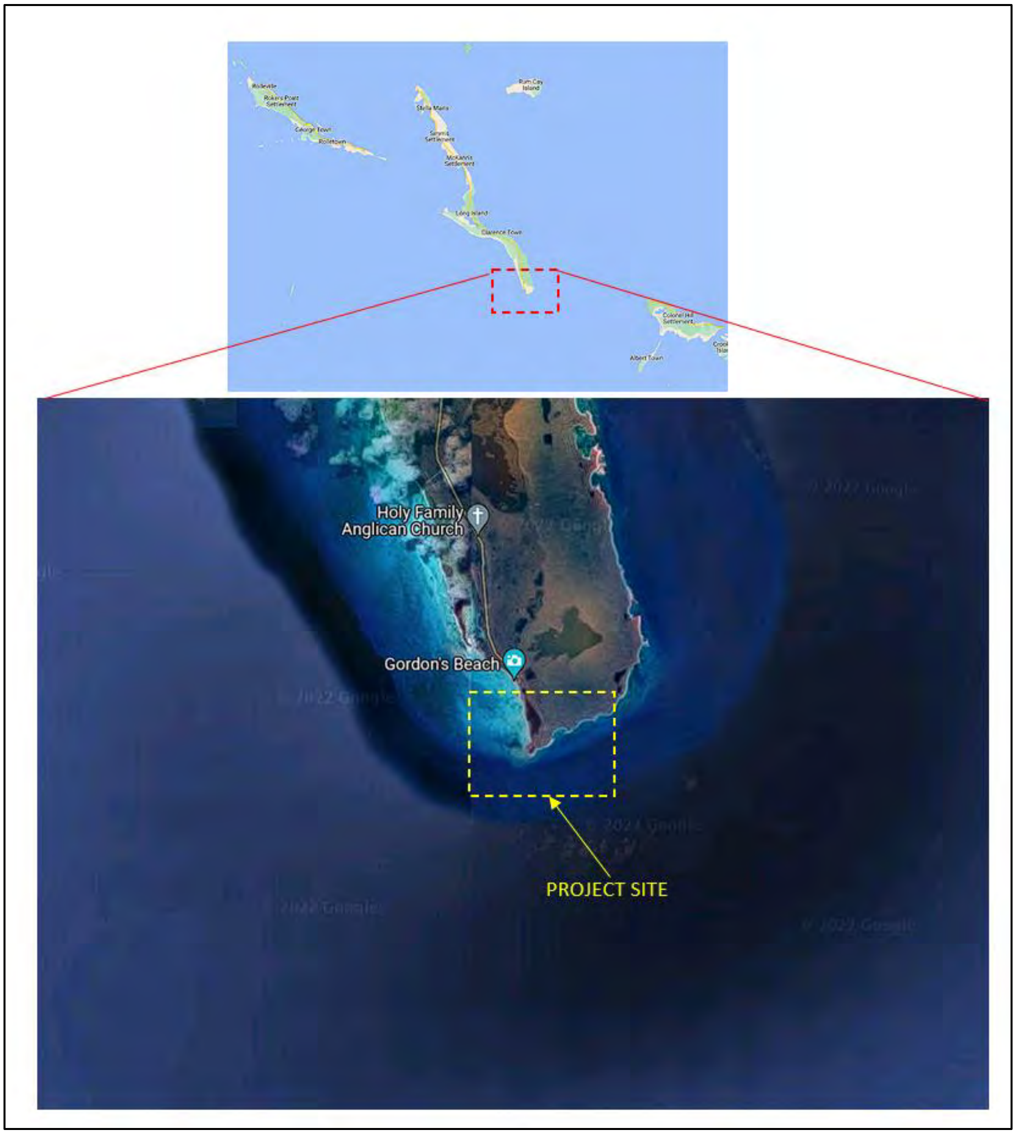


Figure 1.1 Location Map

The purpose of this study is to provide fundamental coastal design parameters for the project layout planning. The study focuses on the following major components:

- Offshore wind and wave statistics.
- Hurricane extreme probability analysis.
- Wave propagation modeling to define operational wave climate in the project vicinity.

The following references are used in this study:

[1] Tideschart: www.tideschart.com

[2] Ocean Surface Currents: https://oceancurrents.rsmas.miami.edu

[3] European Centre for Medium-Range Weather Forecasts (ECMWF) ERA5 Data: https://www.ecmwf.int/en/forecasts/datasets/reanalysis-datasets/era5

[4] NOAA Coastal Services Hurricane Tracks: https://coast.noaa.gov/hurricanes/

[5] Bathymetry: www.navionics.com

2. TIDES AND OCEAN CURRENT

2.1 Tides

Tides at Long Island are semi-diurnal. Tidal range is approximately 1.0 m. Tide fluctuations during a 1-week span on July 12-18, 2022 at Long Island are illustrated in Figure 2.1, according to Tideschart predictions (Ref. [1]).

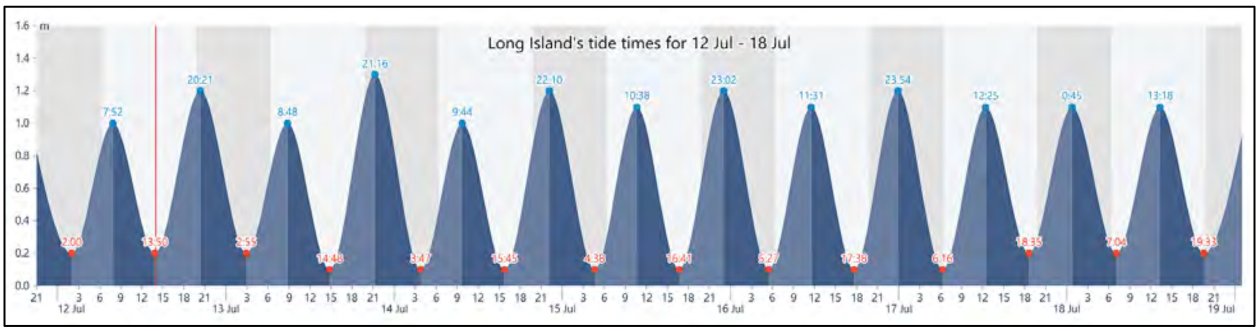
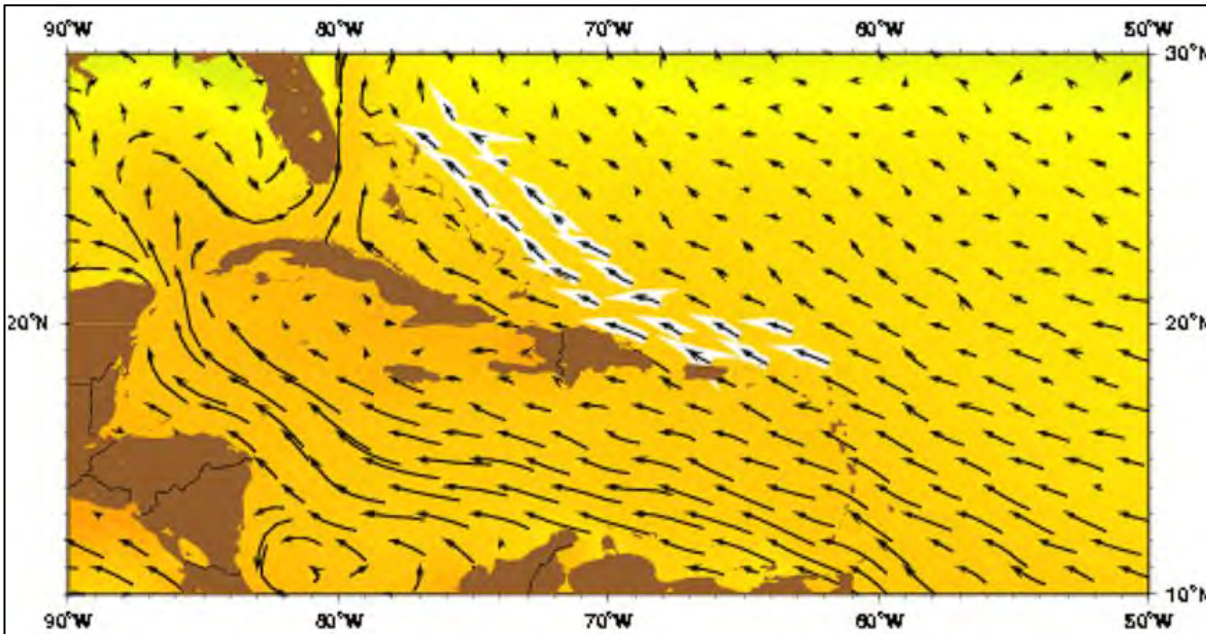


Figure 2.1 Long Island Tide Fluctuations

2.2 Ocean Current

According to Ocean Surface Currents (Ref. [2]), ocean currents around the Bahamian Islands are predominantly flowing northwesterly, with the Antilles current flowing northward east of the Antilles and joins the Florida Current past the outer Bahamas (see Figure 2.2).

Tidal current at the project site is subject to further field investigations.



The Antilles current as represented by the Mariano Global Surface Velocity Analysis (MGSVA). The Antilles Current transports tropical waters from the North Equatorial Current northwestward. It is a significant source of warm water for the Gulf Stream system. Click here for example plots of seasonal averages.

Figure 2.2 The Antilles Current

3. WIND AND OFFSHORE WAVE STATISTICAL ANALYSIS

3.1 Source Data

Due to lack of long term recorded wind and wave climate data in the vicinity of the project site, ERA5 data was acquired and processed to obtain the wind and wave time series for statistical analyses.

ERA5 is the fifth generation European Centre for Medium-Range Weather Forecasts (ECMWF) atmospheric reanalysis of the global climate produced by the Copernicus Climate Change Service (C3S) at ECMWF. ERA5 provides hourly estimates of a large number of atmospheric, land and ocean climate variables. The ERA5 dataset is available for public use for the period from 1979 to 2-3 months before the present. ERA5 provides hourly information of surface variables at approximately 0.25-degree grid spacing.

The available ERA5 grids in the project vicinity are illustrated in Figure 3.1. A close examination of wind and waves show that the predominant wave direction is East to Northeast. Therefore, the ERA5 grid point at (23ºN, 74º45'W) was selected. This grid point is approximately 12 miles northeast of the project site. The 43-year (1979 – 2021) hourly wind and waves data at this grid point were downloaded from ERA5's web site for further processing.

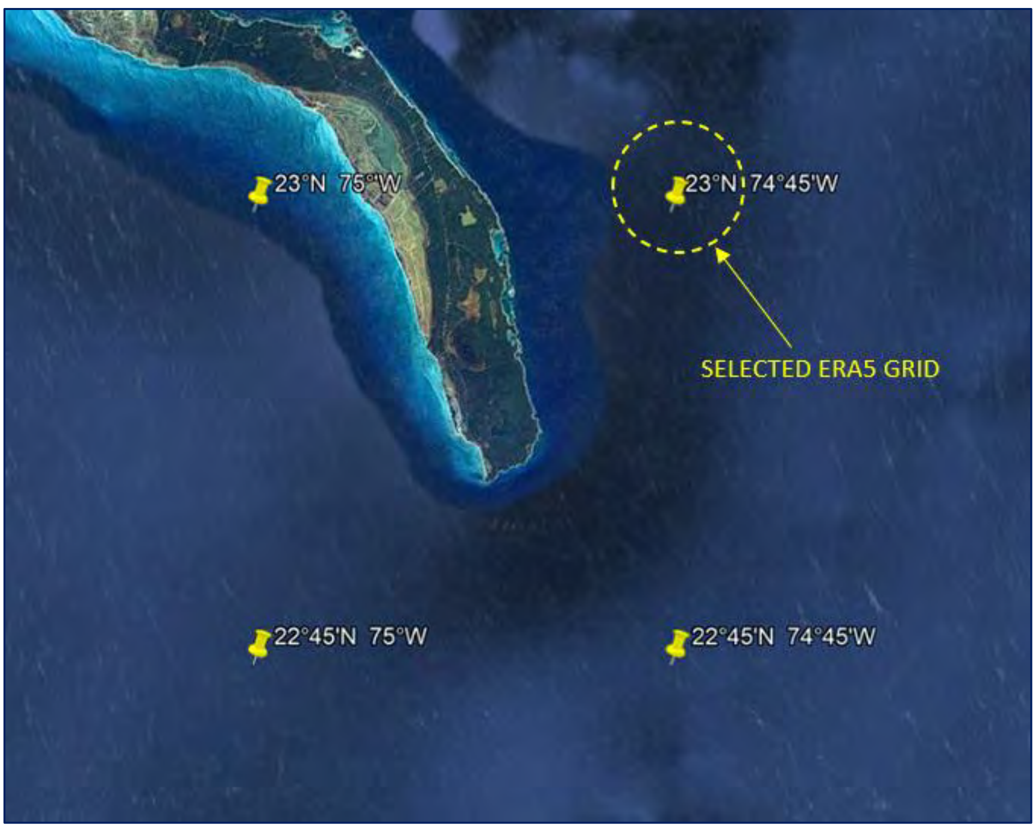


Figure 3.1 ERA5 Grid Locations

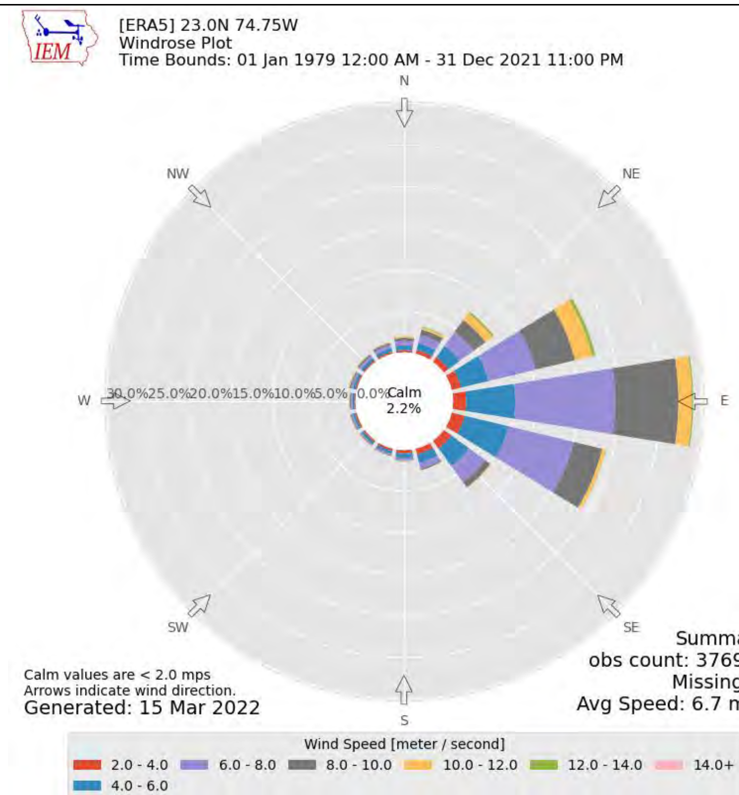
3.2 Wind Statistics

A wind statistical analysis was carried out based on the 43-year hourly wind data at grid (23ºN, 74º45'W). The annual-average wind rose and percentage occurrences for winds from 16 directions and different wind speed intervals are presented in Table 3.1. The monthly wind roses were also developed, as shown in Figure 3.2.

It is seen from Table 3.1 that predominant winds are from the East, the East-Northeast and the East-Southeast directions, with combined percentage occurrences of 66.6%. Winds blow with speeds between 4 m/s to 10 m/s for 80% of the time.

The monthly wind roses in Figure 3.2 show that stronger wind blows during the winter months from October to April. Winds during the summer months from May to September are significantly weaker.

Table 3.1 ANNUAL-AVERAGE WIND STATISTICS



Dir	V(m/s)								Total
	0 ~ 2	2 ~ 4	4 ~ 6	6 ~ 8	8 ~ 10	10 ~ 12	12 ~ 14	14 ~ 16	16 ~ 18	
N	-	0.459	0.548	0.582	0.332	0.145	0.026	0.001	-	**2.1**
NNE	-	0.656	0.859	1.000	0.668	0.289	0.074	0.008	0.002	**3.6**
NE	-	0.948	1.628	2.103	1.753	0.998	0.251	0.030	0.001	**7.7**
ENE	-	1.411	3.382	5.838	4.867	2.140	0.391	0.036	0.002	**18.1**
E	-	1.863	5.844	12.041	7.614	1.634	0.157	0.012	0.006	**29.2**
ESE	-	1.893	5.435	8.056	3.533	0.413	0.032	0.007	0.002	**19.4**
SE	-	1.436	2.581	2.392	0.805	0.080	0.019	0.007	0.002	**7.3**
SSE	-	0.963	1.074	0.693	0.172	0.024	0.010	0.009	0.003	**2.9**
S	-	0.624	0.529	0.297	0.077	0.022	0.006	0.005	0.002	**1.6**
SSW	-	0.467	0.357	0.193	0.076	0.027	0.007	0.005	0.003	**1.1**
SW	-	0.394	0.300	0.176	0.077	0.031	0.007	0.001	0.002	**1.0**
WSW	-	0.387	0.273	0.201	0.095	0.033	0.020	0.001	0.002	**1.0**
W	-	0.334	0.235	0.176	0.109	0.048	0.014	0.001	0.001	**0.9**
WNW	-	0.323	0.331	0.253	0.165	0.094	0.023	0.003	0.002	**1.2**
NW	-	0.342	0.348	0.344	0.200	0.075	0.018	0.001	0.000	**1.3**
NNW	-	0.407	0.442	0.407	0.228	0.098	0.007	0.002	0.001	**1.6**
Total	**-**	**12.9**	**24.2**	**34.8**	**20.8**	**6.2**	**1.1**	**0.1**	**0.0**	**100.0**

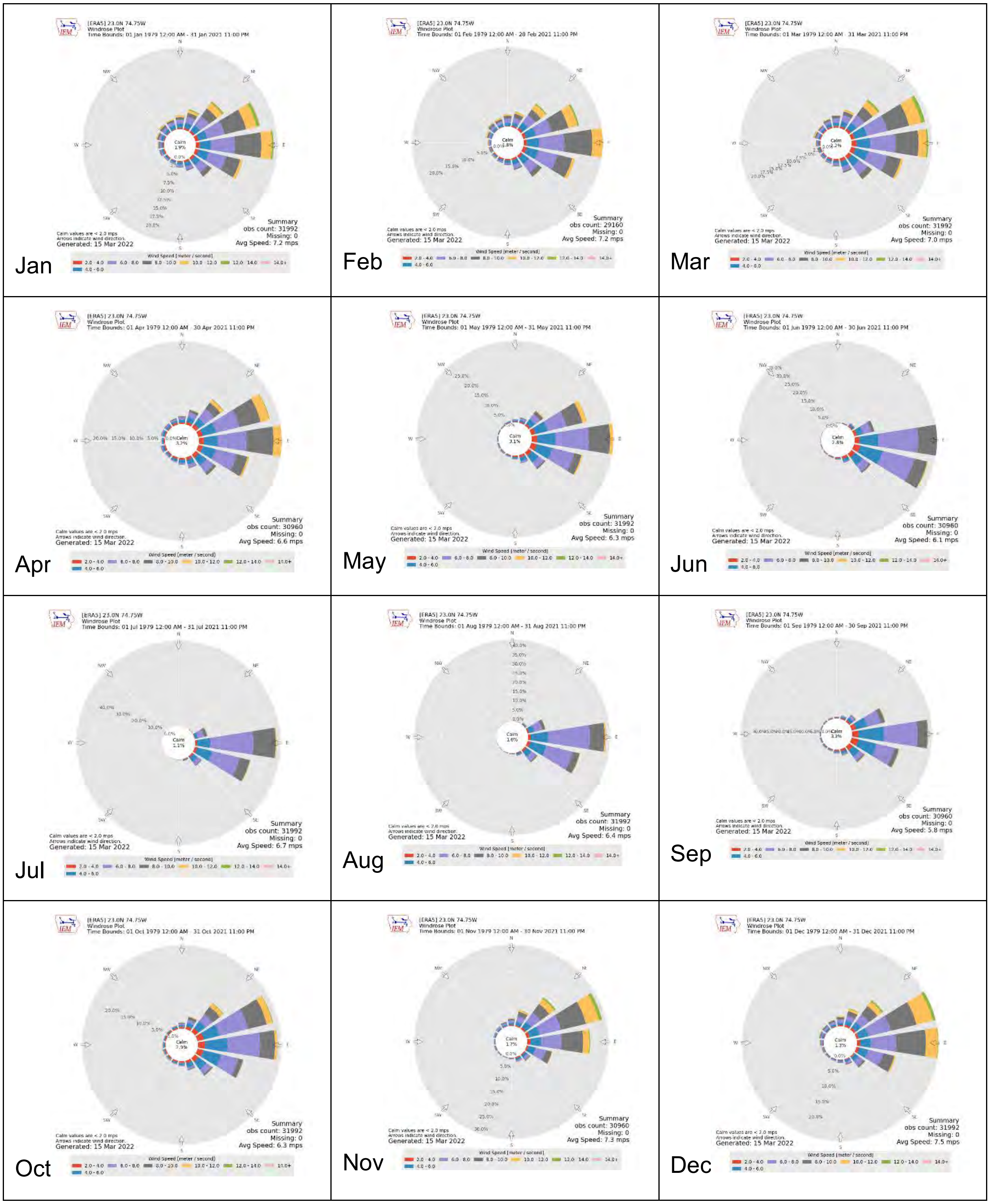


Figure 3.2 Monthly Wind Rose

3.3 Offshore Wave Statistics

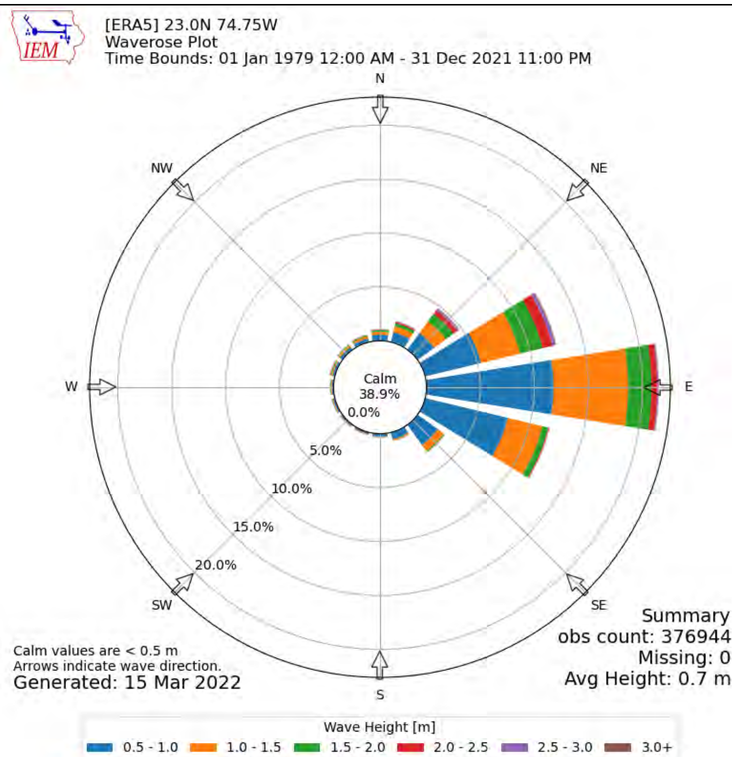
The project site experiences both locally wind-generated waves and long period swell waves generated by storm events far away in the Atlantic Ocean. Typically, local wind waves have higher wave heights and shorter wave periods, while swell waves have lower wave heights and longer wave periods.

Wind wave, swell wave and combined all wave data are provided in the ERA5 dataset. The yearly time series of wind wave, swell wave and combined all wave are presented in Appendix A. The statistical results are discussed in the following sections.

3.3.1 Wind Wave Statistics

The annual-average wind wave rose and the percentage occurrences for various wave directions and significant wave height (H_s) intervals are presented in Table 3.2. It is seen from Table 3.2 that predominant wind waves are from the East, East-Northeast and East-Southeast directions.

Table 3.2 ANNUAL AVERAGE PERCENTAGE OCCURRENCES FOR VARIOUS WIND WAVE DIRECTIONS AND WIND WAVE HEIGHT



Dir	H_s(m)							Total
	0.0 ~ 0.5	0.5 ~ 1.0	1.0 ~ 1.5	1.5 ~ 2.0	2.0 ~ 2.5	2.5 ~ 3.0	>3.0	
N	1.09	0.57	0.26	0.11	0.03	-	-	**2.1**
NNE	1.74	1.01	0.5	0.24	0.09	0.01	0.01	**3.6**
NE	7.73	2.07	1.32	0.71	0.28	0.06	0.03	**12.2**
ENE	6.19	5.75	3.6	1.67	0.52	0.1	0.02	**17.9**
E	9.55	12.77	5.52	1.27	0.21	0.03	0.01	**29.4**
ESE	8.05	7.99	2.25	0.26	0.02	0.01	-	**18.6**
SE	3.69	2.15	0.45	0.04	0.01	-	-	**6.4**
SSE	1.59	0.58	0.08	0.01	0.01	0.01	-	**2.3**
S	0.85	0.23	0.05	0.01	-	-	-	**1.1**
SSW	0.55	0.15	0.04	0.01	-	-	-	**0.8**
SW	0.49	0.15	0.05	0.02	-	-	-	**0.7**
WSW	0.45	0.16	0.07	0.02	0.02	-	-	**0.7**
W	0.38	0.15	0.07	0.04	0.02	-	-	**0.7**
WNW	0.51	0.22	0.12	0.08	0.03	-	-	**1.0**
NW	0.7	0.3	0.15	0.06	0.02	-	-	**1.2**
NNW	0.82	0.36	0.19	0.08	0.02	-	-	**1.5**
Total	**44.4**	**34.6**	**14.7**	**4.6**	**1.3**	**0.3**	**0.1**	**100**

The wind wave scatter diagram over H_s and T_m (mean wave period) and the histograms are presented in Figure 3.3.

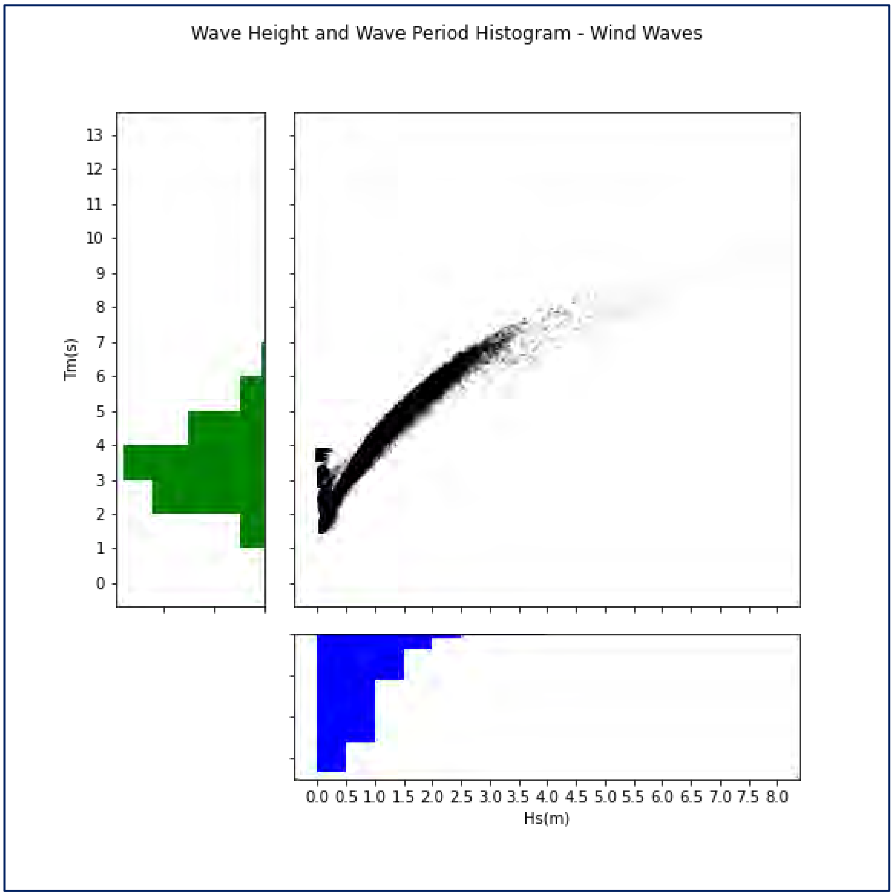


Figure 3.3 Wind Wave Scatter Diagram and Histogram

The monthly wind wave roses are presented in Figure 3.4. It is seen from Figure 3.4 that wind waves are much higher during the months from October to April as compared to the months from May to September.

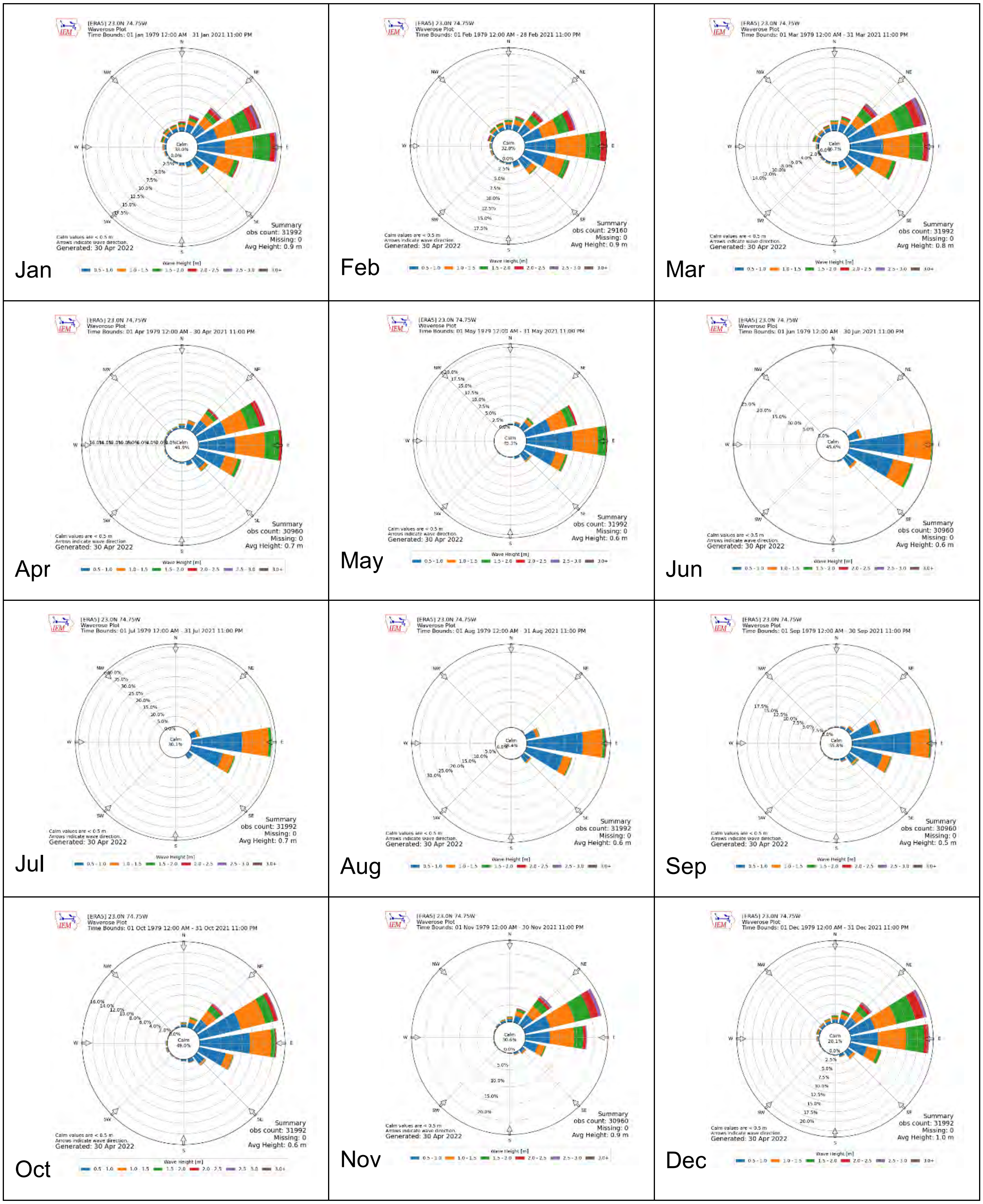
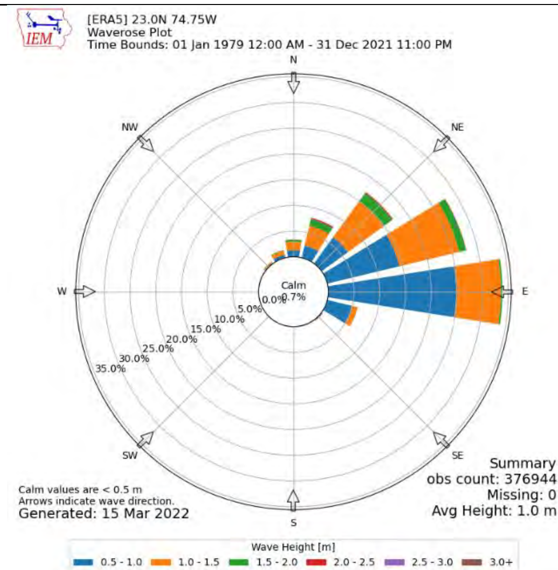


Figure 3.4 Monthly Wind Wave Rose

3.3.2 Swell Wave Statistics

The annual-average swell wave rose and the percentage occurrences for various wave directions and H_s intervals are presented in Table 3.3. It is seen from Table 3.3 that predominant swell waves are from the East, East-Northeast and Northeast directions.

Table 3.3 ANNUAL AVERAGE PERCENTAGE OCCURRENCES FOR VARIOUS SWELL WAVE DIRECTIONS AND SWELL WAVE HEIGHT



Dir	Hs(m)							Total
	0.0 ~ 0.5	0.5 ~ 1.0	1.0 ~ 1.5	1.5 ~ 2.0	2.0 ~ 2.5	2.5 ~ 3.0	>3.0	
N	0.04	1.92	1.25	0.18	0.01	0.01	-	**3.4**
NNE	0.06	3.9	3.26	0.74	0.09	0.01	-	**8.0**
NE	0.18	9.48	6.68	0.81	0.07	-	-	**17.2**
ENE	0.68	19.34	7.55	0.39	0.02	-	-	**28.0**
E	1.13	29.33	3.67	0.07	-	-	-	**34.2**
ESE	0.27	5.49	0.38	0.01	-	-	-	**6.2**
SE	0.03	0.23	0.04	0.01	-	-	-	**0.3**
SSE	0.02	0.12	0.04	0.01	-	-	-	**0.2**
S	0.01	0.06	0.01	-	-	-	-	**0.1**
SSW	0.01	0.03	0.01	-	-	-	-	**0.0**
SW	0.01	0.03	0.01	-	-	-	-	**0.1**
WSW	0.01	0.03	0.01	-	-	-	-	**0.0**
W	0.01	0.04	0.01	-	-	-	-	**0.1**
WNW	0.02	0.07	0.03	-	-	-	-	**0.1**
NW	0.02	0.27	0.19	0.01	-	-	-	**0.5**
NNW	0.03	0.91	0.61	0.04	-	-	-	**1.6**
Total	**2.5**	**71.3**	**23.8**	**2.3**	**0.2**	**0.0**	**-**	**100.0**

The swell wave scatter diagram over H_s and T_m and the histograms are presented in Figure 3.5.

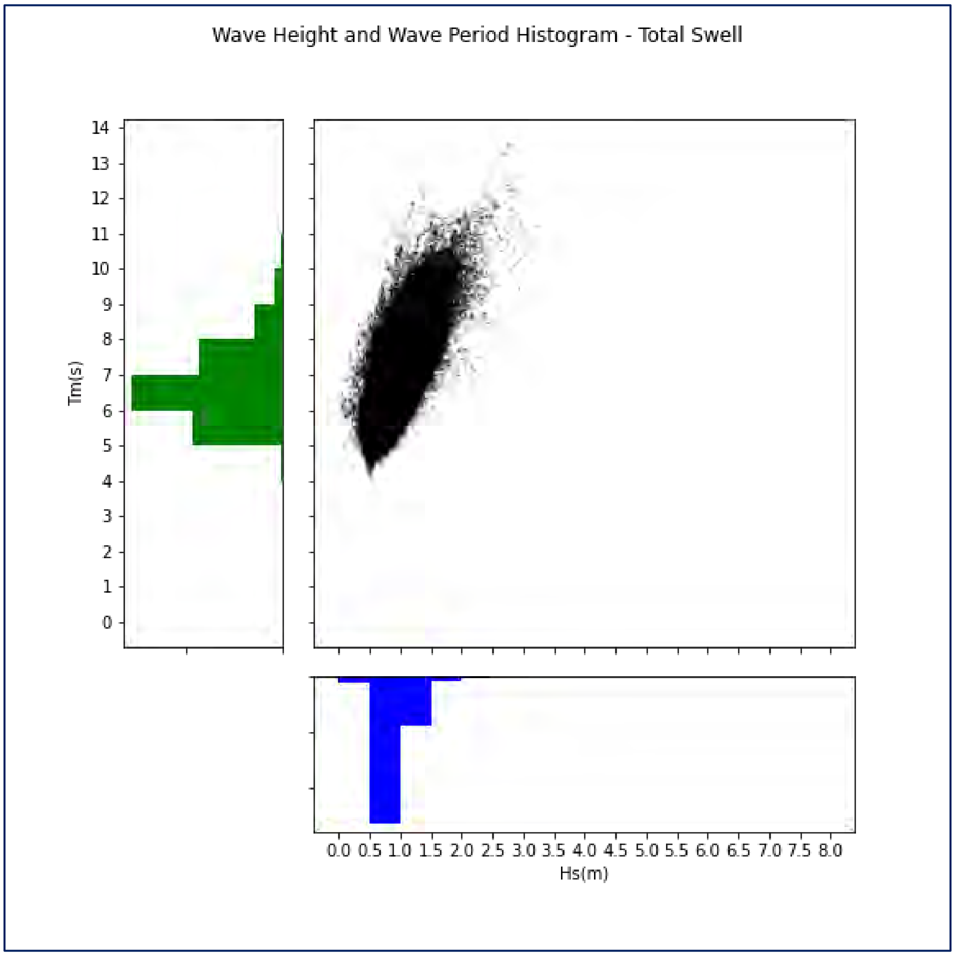


Figure 3.5 Swell Wave Scatter Diagram and Histogram

The monthly swell wave roses are presented in Figure 3.6. It is seen from Figure 3.6 that swell waves are much higher during the months from October to April as compared to the months from May to September.

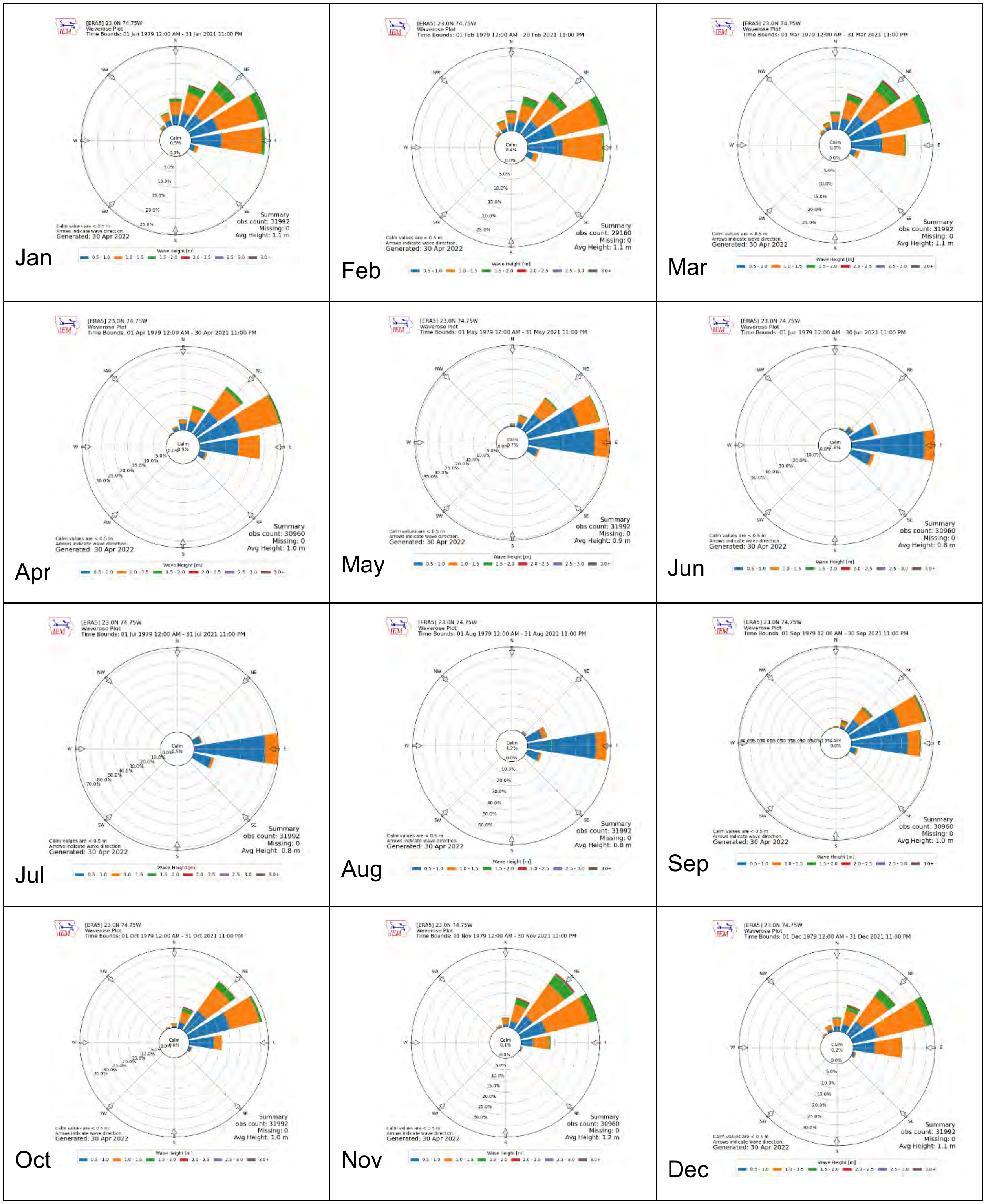
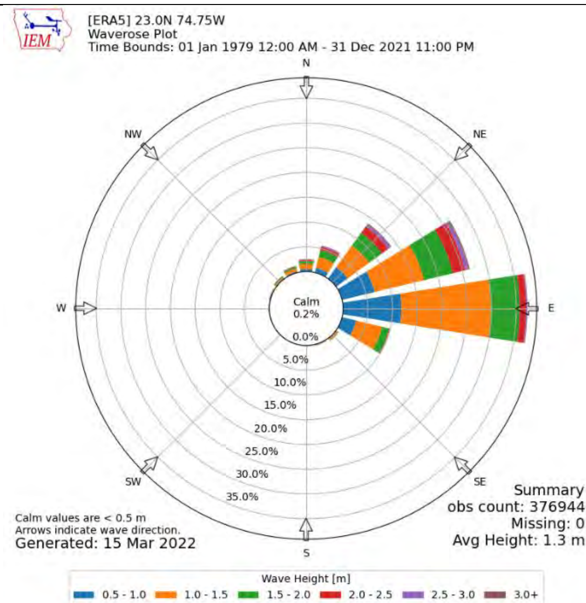


Figure 3.6 Monthly Swell Wave Rose

3.3.3 All Wave Statistics

The annual-average combined wind and swell wave rose and the percentage occurrences for various wave directions and H_s intervals are presented in Table 3.4. It is seen from Table 3.4 that predominant waves are from the East, the East-Northeast and the Northeast directions.

Table 3.4 ANNUAL AVERAGE PERCENTAGE OCCURRENCES FOR VARIOUS WAVE DIRECTIONS AND WAVE HEIGHT – ALL WAVES



Dir	Hs(m)							Total
	0.0 ~ 0.5	0.5 ~ 1.0	1.0 ~ 1.5	1.5 ~ 2.0	2.0 ~ 2.5	2.5 ~ 3.0	>3.0	
N	0.01	0.86	1.04	0.42	0.13	0.02	0.01	**2.5**
NNE	0.02	1.69	2.33	1.16	0.36	0.1	0.02	**5.7**
NE	0.09	4.48	5.38	2.58	0.98	0.22	0.08	**13.8**
ENE	0.37	9.83	10.16	4.61	1.3	0.3	0.05	**26.6**
E	0.43	17.96	15.15	3.24	0.5	0.07	0.01	**37.4**
ESE	0.09	4.83	4.44	0.59	0.08	0.02	0.01	**10.1**
SE	0.01	0.32	0.23	0.05	0.01	0.01	0.01	**0.7**
SSE	-	0.14	0.1	0.02	0.01	0.01	-	**0.3**
S	-	0.06	0.05	0.02	0.01	-	0.01	**0.2**
SSW	-	0.04	0.02	0.01	0.01	-	-	**0.1**
SW	-	0.03	0.04	0.03	0.01	-	-	**0.1**
WSW	-	0.03	0.05	0.02	0.02	-	-	**0.1**
W	-	0.04	0.05	0.03	0.02	-	-	**0.2**
WNW	-	0.05	0.11	0.09	0.05	-	-	**0.3**
NW	-	0.14	0.31	0.17	0.06	0.01	-	**0.7**
NNW	0.01	0.45	0.64	0.25	0.04	-	-	**1.4**
Total	**1.0**	**40.9**	**40.1**	**13.3**	**3.6**	**0.8**	**0.2**	**100**

The combined all wave scatter diagram over H_s and T_m and the histograms are presented in Figure 3.7.

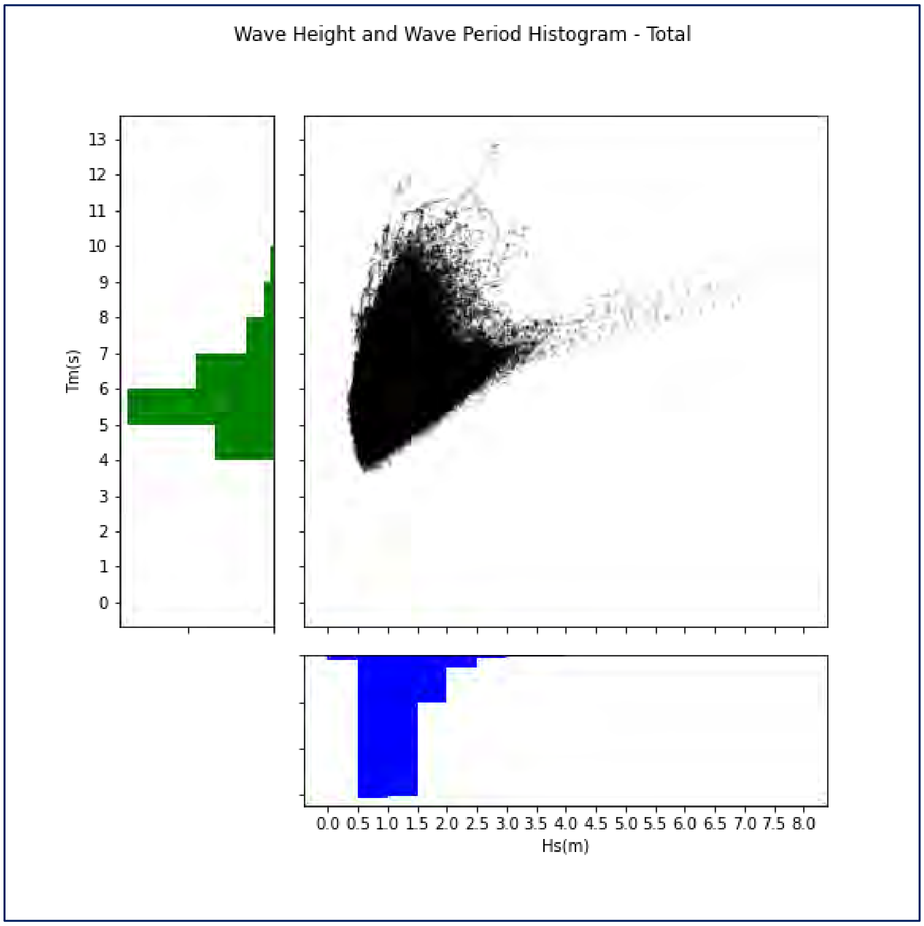


Figure 3.7 All Wave Scatter Diagram and Histogram

The monthly all wave roses are presented in Figure 3.8. It is seen from Figure 3.8 that swell waves are much higher during the months from October to April as compared to the months from May to September.

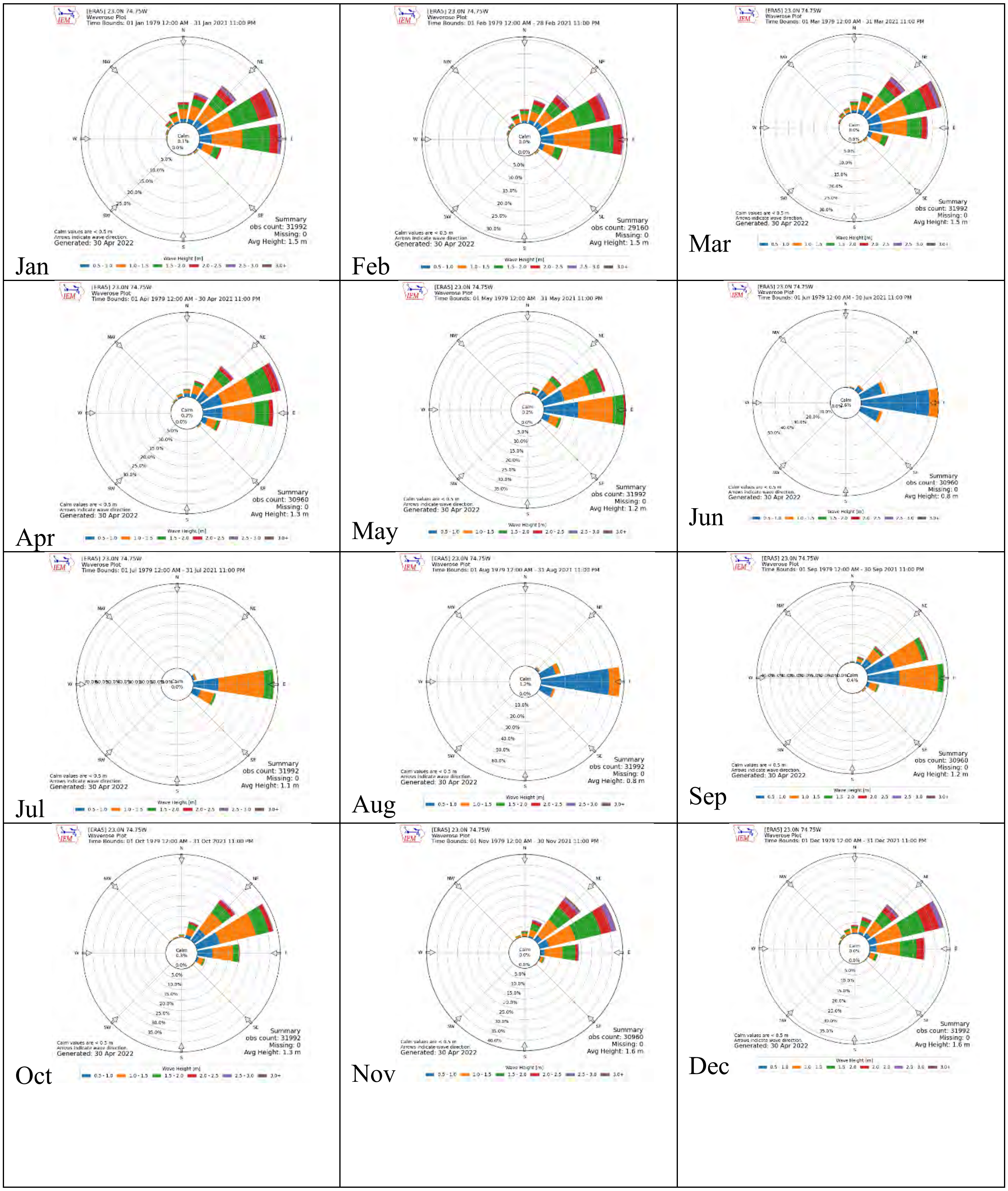


Figure 3.8 Monthly All Wave Rose

4. TROPICAL STORMS AND HURRICANES

4.1 Hurricane Tracks

A hurricane is defined as a severe tropical, cyclonic storm that results in rising water levels (or storm surge) and the development of large storm waves that can cause severe damage to coastal communities. Hurricanes typically develop North of the equator in the tropical and subtropical latitudes of the Atlantic Ocean. Characteristics of hurricanes include low barometric pressure, high winds over 64 knots (74 mph), heavy rainfall, large waves, and storm surges. The hurricane season in the Caribbean typically extends from June to late October. The hurricane paths are generally unpredictable and can range from due Westward to a gradual curvature Northward, thereby impacting the Gulf, Caribbean Islands, and the U.S. coast. The Saffir-Simpson Scale categorizes a hurricane as being a category one, two, three, four, or five, depending upon its characteristics, as presented in Table 4.1. The potential damage that may be caused by each category of hurricane is also described in Table 4.1.

The Long Island experiences frequent tropical storms and hurricanes. In the 170-year history from 1851 to 2021, 72 tropical storms and hurricanes have passed through within 60 nautical miles from the Long Island. Among these storms, 30 are hurricanes. Figure 4.1 illustrates the tracks of the 30 hurricanes that passed through within 60 nautical miles from the Long Island (from NOAA National Coastal Services, Ref. [4]):

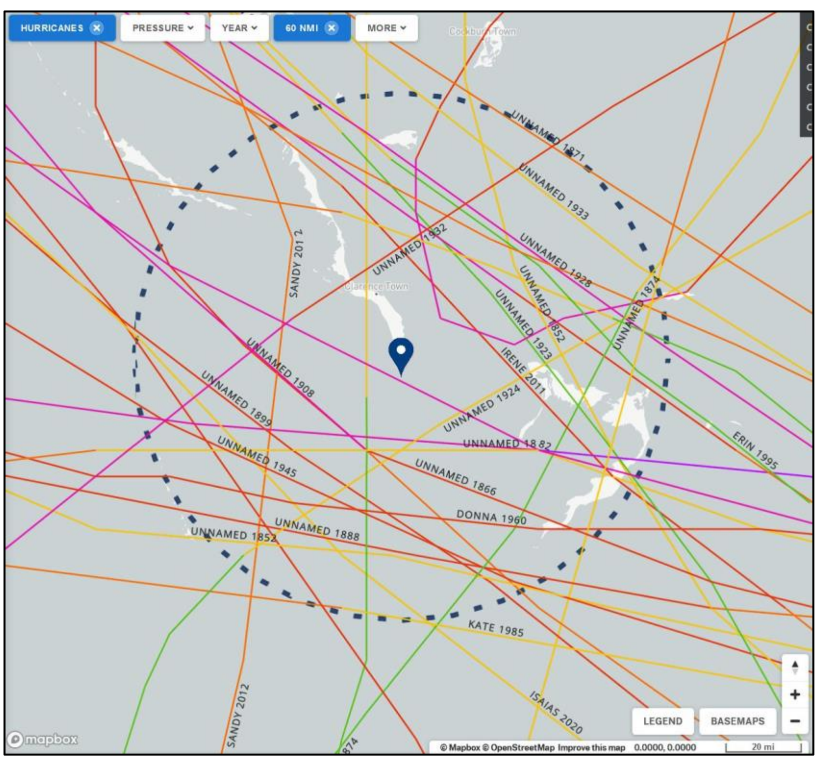


Figure 4.1 Historical Hurricane Tracks

Table 4.1 CLASSIFICATION OF HURRICANES BY SAFFIR-SIMPSON SCALE

Meteorological Characteristics						
CATEGORY	**WINDS – 1 min. (knots)**	**(mph)**	**PRESSURE (millibars)**	**(inches)**	**STORM SURGE ELEVATION***	**DAMAGE**
1	64 - 83	74 - 95	> 980	> 28.9	4 - 5	**Minimal**
2	83 - 95	96 - 110	965 - 979	28.5 - 28.9	6 - 8	**Moderate**
3	96 - 113	111 - 130	945 - 964	27.9 - 28.5	9 - 12	**Extensive**
4	114 - 135	131 - 155	920 - 944	27.2 - 27.9	13 - 18	**Extreme**
5	> 135	> 155	< 920	< 27.2	18	**Catastrophic**

* Elevation difference from sea level (ft.)

Damage Characteristics

Category	
ONE	**Minimal:** No real damage to building structures. Damage primarily to unanchored mobile homes, trees, and foliage. Some damage to poorly constructed signs. Low-lying coastal roads inundated, minor pier damage, some small craft in exposed anchorage torn from moorings.
TWO	**Moderate:** Considerable damage to shrubbery and tree foliage: some trees blown down; some roofing material, door and window damage to buildings. Considerable damage to vegetation, mobile homes, and piers. Coastal roads and low-lying escape routes inland cut by rising water 2 to 4 hours before arrival of hurricane center. Marinas flooded. Small craft in unprotected anchorages torn from moorings.
THREE	**Extensive:** Some structural damage to small residences and utility buildings with a minor amount of curtain wall failures. Foliage torn from trees; large trees blown down. Practically all poorly constructed signs blown down. Mobile homes are destroyed. Some damage to roofing materials of buildings; some window and door damage. Some structural damage to small buildings. Flooding near the coast destroys smaller structures with larger structures damaged by floating debris. Terrain continuously lower than 5 feet above sea level (ASL) may be flooded inland 8 miles or more.
FOUR	**Extreme:** More extensive curtain wall failures with some complete roof structure failure on small residences. Shrubs and trees blown down; all signs down. Extensive damage to roofing materials, windows, and doors. Major erosion of beach areas. Major damage to lower floors of structures near the shore. Terrain continuously lower than 10 feet ASL may be flooded, requiring massive evacuation of residential areas inland as far as 6 miles.
FIVE	**Catastrophic:** Complete roof failure on many residences and industrial buildings. Shrubs and trees blown down. Very severe and extensive damage to windows and doors. Some complete building failures with small utility buildings overturned and blown over or away. Major damage to lower floors of all structures located less than 15 feet ASL and within 500 yards of the shoreline. Massive evacuation of residential areas on low ground within 5 to 10 miles of the shoreline may be required.

4.2 Extreme Probability Analysis and Design Hurricanes

The 30 hurricanes that passed within 60 nautical miles from the project site are summarized in Table 4.2 with peak wind speed in descending order. Hurricane eye air pressure, peak wind speed, category, significant wave height (H_s) and peak wave period (T_p) from the ERA5 dataset are presented in Table 4.2. The hurricanes in the ERA5 dataset are highlighted in red. It is noted that six Category 4 hurricanes have passed through the project vicinity in the past 170 years.

Table 4.2 HISTORICAL HURRICANES THAT PASSED THROUGH PROJECT VICINITY

No.	Date	Name	Pressure (mb)	Speed (kn)	Category	H_s (m)	T_p (s)
1	8/31/1933	Unnamed	NA	135	H4		
2	9/15/1928	Unnamed	NA	135	H4		
3	9/17/1926	Unnamed	NA	125	H4		
4	10/2/2015	Joaquin	935	120	H4	7.73	9.97
5	10/1/1866	Unnamed	NA	120	H4		
6	7/25/1926	Unnamed	NA	115	H4		
7	11/10/1932	Unnamed	NA	110	H3		
8	10/5/2016	Matthew	963	105	H3	6.41	10.93
9	8/11/1899	Unnamed	NA	105	H3		
10	9/14/1945	Unnamed	NA	105	H3		
11	9/3/1888	Unnamed	NA	105	H3		
12	9/8/1960	Donna	951	100	H3		
13	8/24/2011	Irene	954	100	H3	6.48	9.13
14	9/12/1908	Unnamed	NA	100	H3		
15	10/3/1859	Unnamed	NA	90	H2		
16	10/25/2012	Sandy	963	90	H2	6.3	10.51
17	8/23/1871	Unnamed	NA	90	H2		
18	9/7/1919	Unnamed	NA	85	H2		
19	8/23/1891	Unnamed	NA	85	H2		
20	11/18/1985	Kate	972	85	H2	5.57	7.72
21	9/4/1882	Unnamed	NA	80	H1		
22	8/21/1852	Unnamed	NA	80	H1		
23	9/27/1852	Unnamed	NA	80	H1		
24	7/28/1933	Unnamed	NA	75	H1		
25	10/11/1884	Unnamed	NA	70	H1		
26	10/4/1874	Unnamed	NA	70	H1		
27	8/1/1995	Erin	992	70	H1	2.47	6.68
28	7/31/2020	Isaias	990	70	H1	5.02	8.3
29	11/10/1924	Unnamed	NA	70	H1		
30	9/26/1923	Unnamed	NA	65	H1		

In order to determine long term design hurricanes at the project site, an extreme probability analysis was conducted based on the hurricane record presented in Table 4.2. A Gumbel distribution was fitted to the accumulative probabilities of the corresponding extreme events with respect to the associated wind speeds. The Gumbel distribution is defined as:

$$V = A\left[-\ln\left(\ln\frac{1}{P}\right)\right]^{B}$$

where P is the accumulative probability that wind speed is less than or equal to the wind speed being considered, V is wind speed, A and B are the fitting coefficients.

The fitted Gumbel distribution of the maximum wind speeds (V) based on the historical hurricanes passing through the area is presented in Figure 4.2. As seen in the figure, the derived Gumbel distribution fits well with the historical event accumulative probabilities, with a correlation coefficient of 0.97 (a correlation coefficient of 1.0 indicate a perfect fit to the real events).

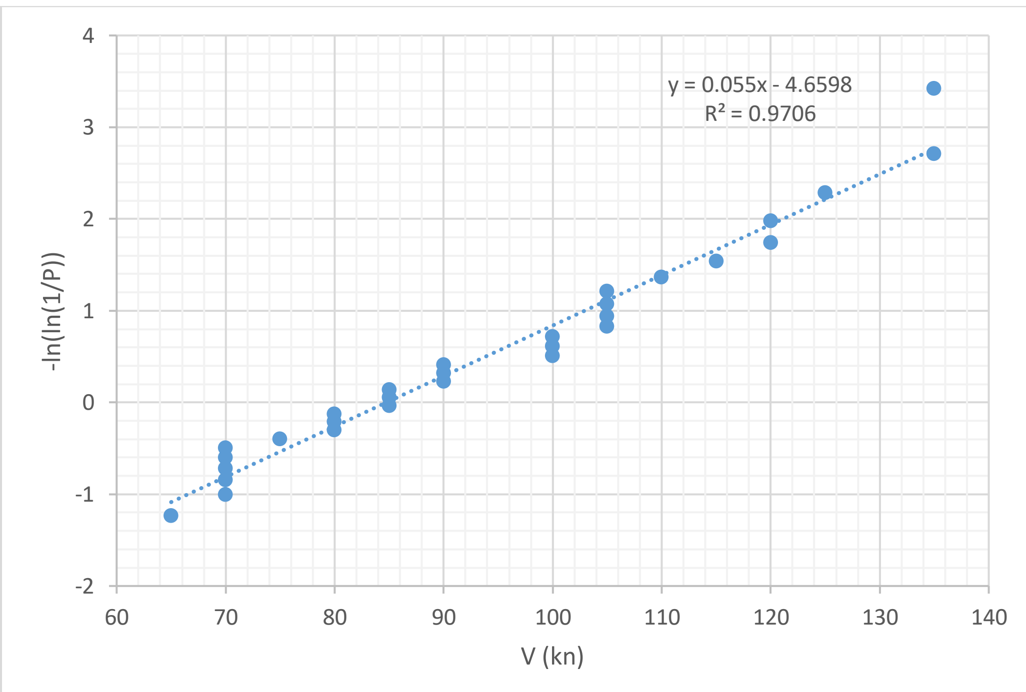


Figure 4.2 Gumbel Distribution – Maximum Wind Speed

The derived Gumbel distribution can be utilized to predict long-term design conditions. The return periods associated with the cumulative probabilities are given by:

$$\frac{T_R}{r} = \frac{1}{1 - P}$$

where T_R is the return period, and r is the time interval between successive storm events.

Based on this approach, the design hurricane wind speeds for the 10-, 25-, 50- and 100-year return periods were determined. The results are presented in Table 4.3:

Table 4.3 LONG TERM DESIGN HURRICANE WIND SPEED

Return Period (Year)	Maximum 1-Minute Wind Speed V (knot)	Maximum 1-Minute Wind Speed V (m/s)	Maximum 1-Hour Wind Speed V (m/s)
10	88.0	45.3	35.4
25	109.4	56.3	44.0
50	123.2	63.4	49.5
100	136.4	70.2	54.8

$V_{1\text{-hour}} = V_{1\text{-min}} / 1.28$

5. WAVE PROPAGATION MODELING

5.1 Numerical Model Setup

Waves undergo significant changes in height and direction when propagating from deep water in the open ocean to shallow water in the nearshore coast due to refraction, diffraction, shoaling, breaking and bottom dissipation effects. In this study the MIKE21 Spectral Wave (SW) model is used to simulate wave propagation. MIKE21 is a numerical modeling suite developed by the Danish Hydraulic Institute (DHI). The MIKE21 SW model is based on unstructured meshes and simulates the growth, decay and transformation of wind-generated waves and swells. The MIKE21 SW model includes the full spectral formulation, which is based on the wave action conservation equation where the direction-frequency wave action spectrum is the dependent variable. The model has the ability to simulate the following physical phenomena:

- Wave growth by action of wind
- Non-linear wave-wave interaction
- Dissipation due to white-capping
- Dissipation due to bottom friction.
- Dissipation due to depth-included wave breaking
- Refraction and shoaling due to depth variations
- Wave-current interaction
- Effect of time-varying water depth and flooding and drying

The MIKE21 SW model was set up through preparing the land boundary and bathymetry data, generating mesh, preparing the wind forcing time series and wave boundary time series input, and specifying model parameters.

The bathymetric data and land boundary data were obtained from Navionics (www.navionics.com), as illustrated in Figure 5.1. The model bathymetry was obtained through an image rectifying and bathymetry contour and land boundary digitizing process, followed by a mesh generation process. The digitized model mesh and bathymetry are illustrated in Figure 5.2. The model mesh consists of 1,428 nodes and 2,588 triangular elements. In order to increase the efficiency of the wave model, coarser mesh is applied to the deep water and finer mesh is applied to the shallow water in the nearshore area. The northwest quarter of the model domain is artificially eliminated from the model in order to reduce the model CPU run time. This model modification has no effect on accuracy of the wave model results in the project site vicinity.

The ERA5 wave time series are applied to the eastern boundary of the model domain. The rest boundaries are defined as lateral boundaries where waves will pass through. The ERA5 wind time series are applied throughout the model domain. The specification of these boundary conditions allows the model to properly simulate waves from the easterly directions. It is noted that westerly waves were not properly simulated in this model setup because of lack of wave boundary specification at the western model boundary.

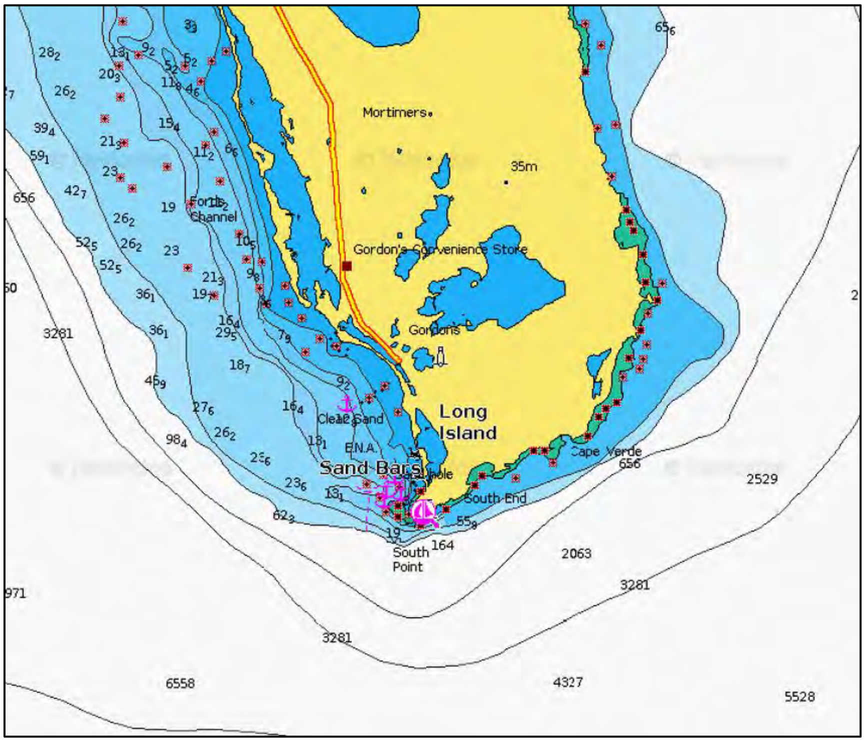


Figure 5.1 Bathymetry from Navionics

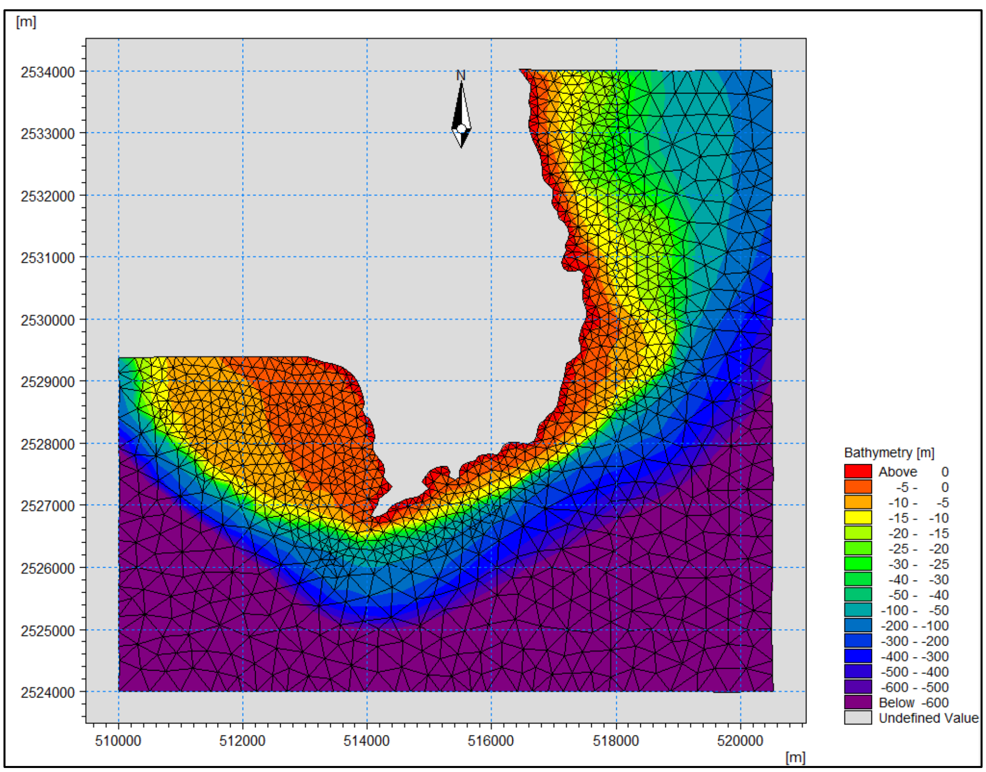


Figure 5.2 Model Mesh and Bathymetry

5.2 Model Simulation Results

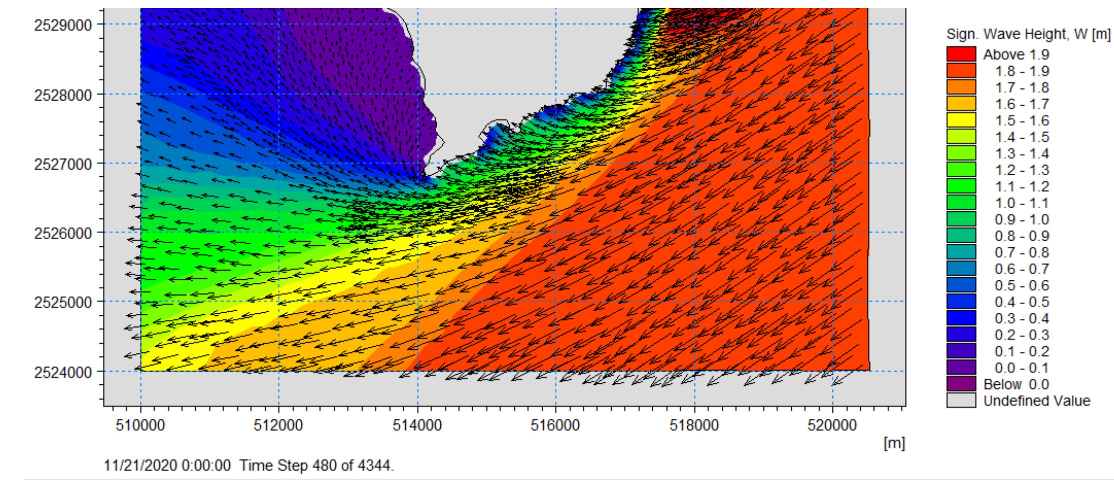
The offshore wave statistical results show that waves are significantly higher in the winter months as compared to the summer months. The winter months are also the primary cruise season. Therefore, the wave model simulations focus on the operational wave climate in the project vicinity during the winter months.

In this study, a six-month wave propagation model simulation from November 1st to April 30th was carried out for each year from 2016 to 2021. The computer CPU run time for each six-month model simulation is approximately 50 hours on a powerful PC equipped with a 16-core AMD 5950X CPU, 32GB memory and an AMD 6700X GPU. The model simulations were carried out in full-spectral mode. The model output hourly wind wave, swell and combined all wave parameters throughout the model domain. Each model output file is approximately 660 MB in file size.

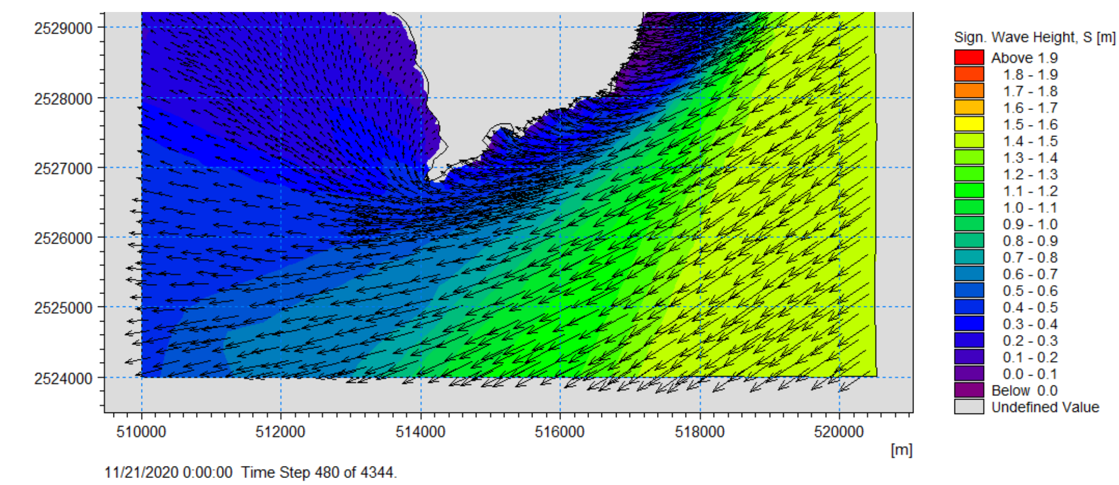
The model results under the typical northeasterly offshore wave conditions are illustrated in Figure 5.3. It is seen from these results that the project vicinity is well sheltered from northeasterly offshore waves. Both wind waves and swells decrease in height significantly when arriving at the project site.

The model results under the typical easterly offshore wave conditions are illustrated in Figure 5.4. These results show that the project site is somewhat less sheltered as compared to northeasterly offshore wave conditions. It is noted that both wind waves and swells turn northwesterly at the project site with moderate decrease in wave heights.

Wind Wave



Swell



All Wave

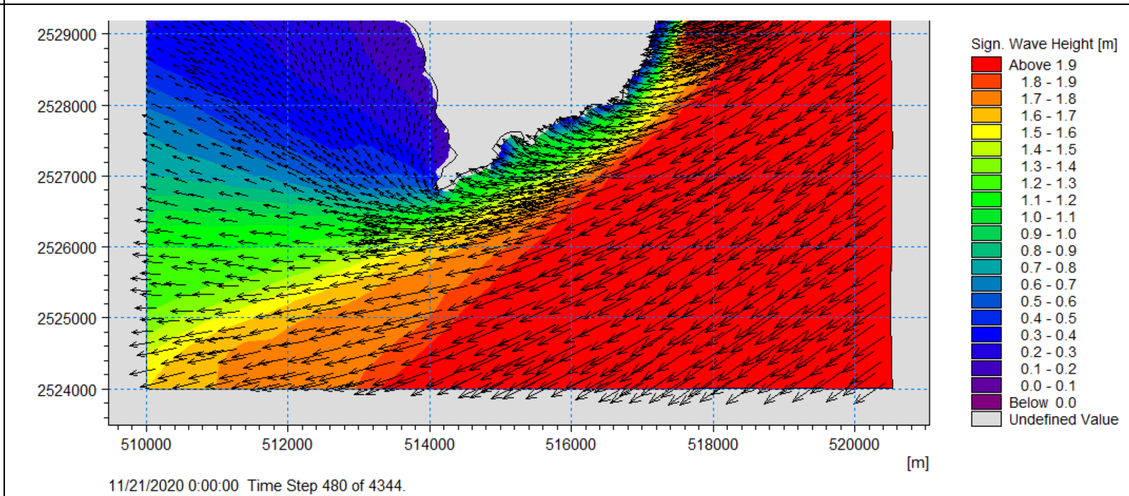


Figure 5.3 Model Results – Typical Northeasterly Waves

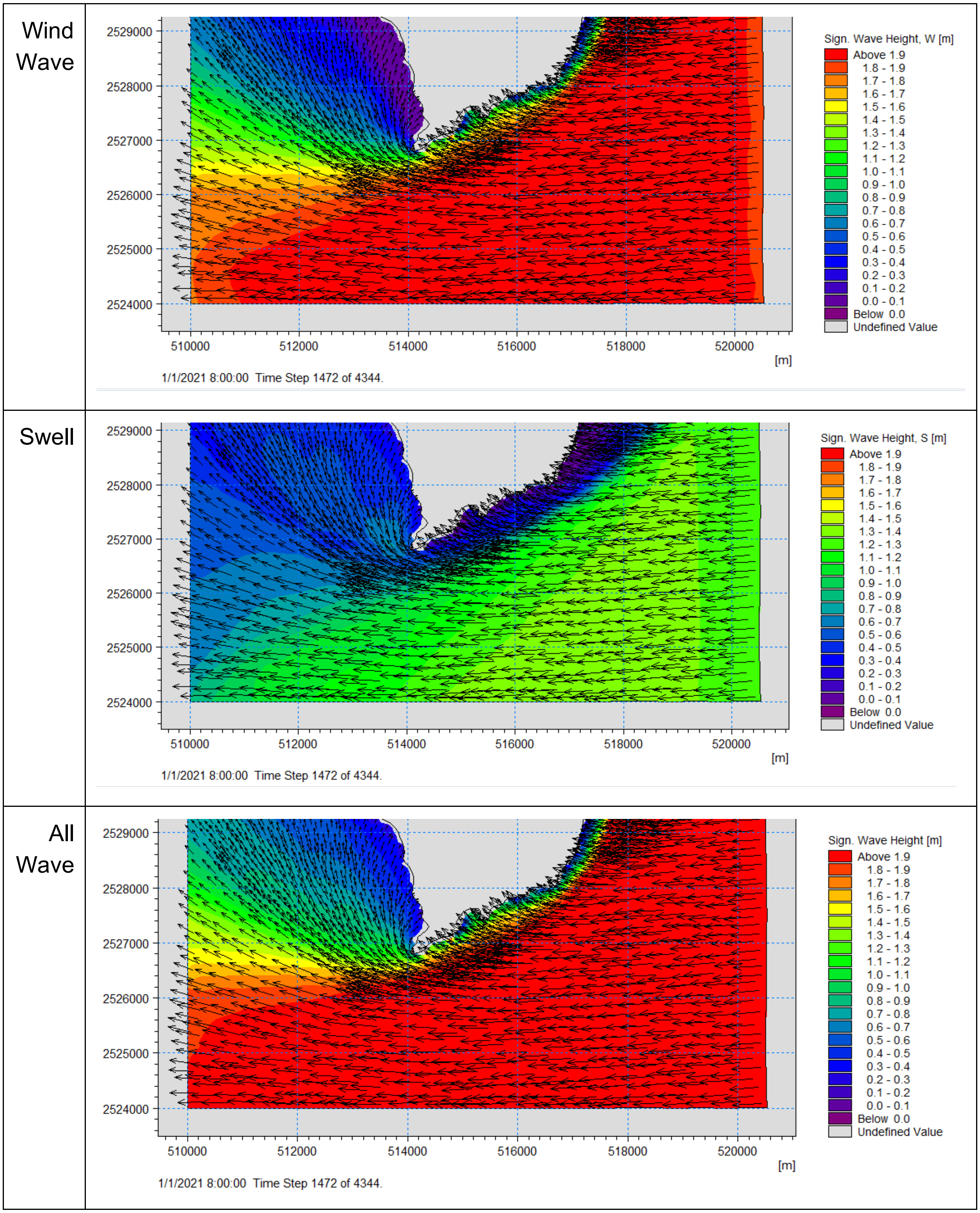


Figure 5.4 Model Results – Typical Easterly Waves

In order to quantify wave statistics in the project vicinity, four different locations shown as Point A, B, C, and D in Figure 5.5 are selected. Point A is located at 40 m depth of water south of the project site. Point B is at 12 m depth of water to the South, Point C is at 12 m depth of water to the West, and Point D is located at 5 m water depth closer to the shoreline to the West. Points B, C and D represent three possible locations of the cruise terminal. Time series model results were extracted from the model results for further post-processing.

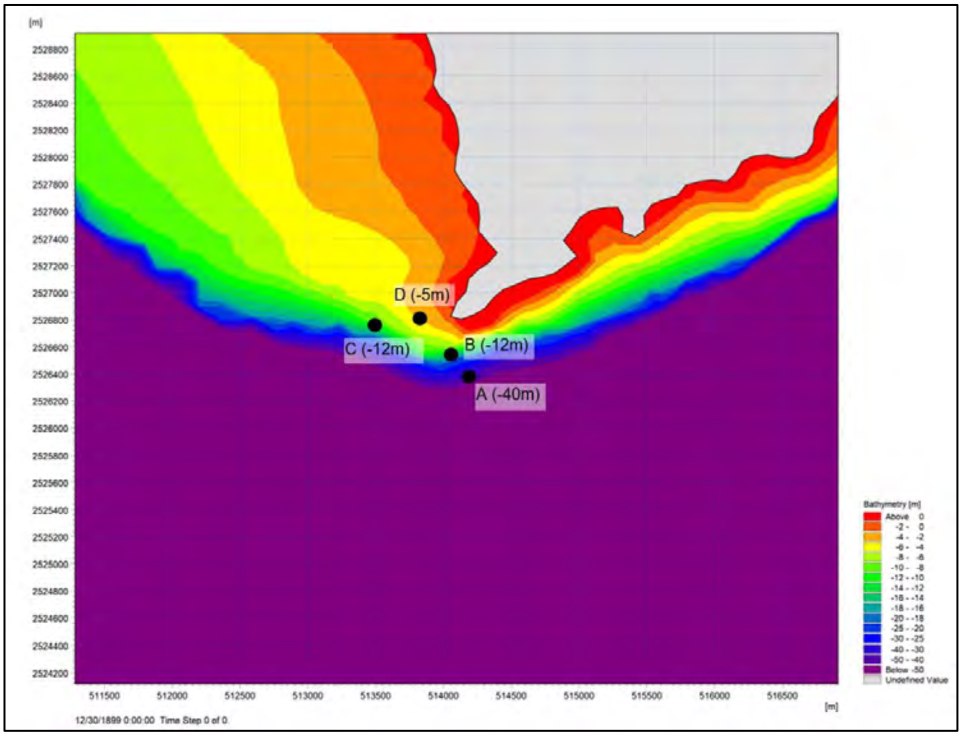
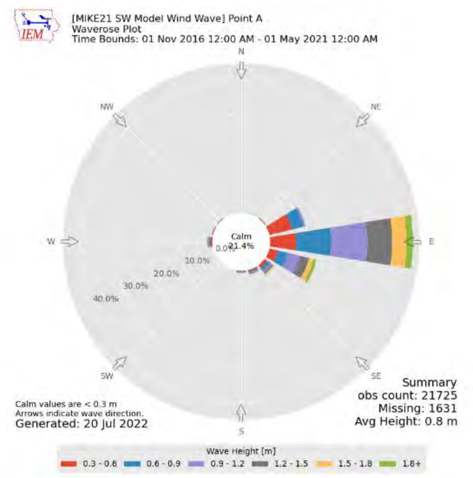


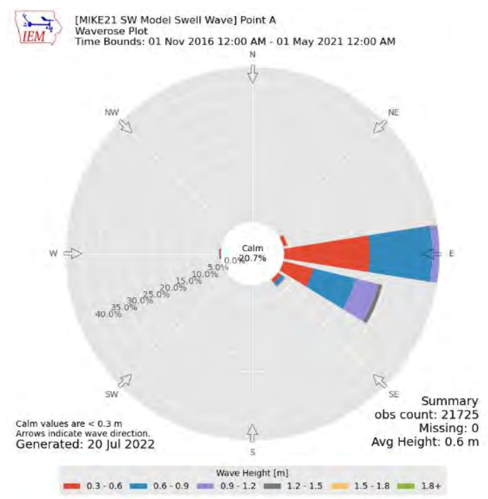
Figure 5.5 Locations of Model Result Extraction Points

Based on the wave model results for the five winter seasons, wave roses for wind wave, swell and combined all wave at each of the four selected points were developed, as presented in Figure 5.6, Figure 5.7, Figure 5.8, and Figure 5.9, respectively. The comparisons of wave roses of all waves at the four different locations are presented in Figure 5.10.

Wind Wave



Swell



All Wave

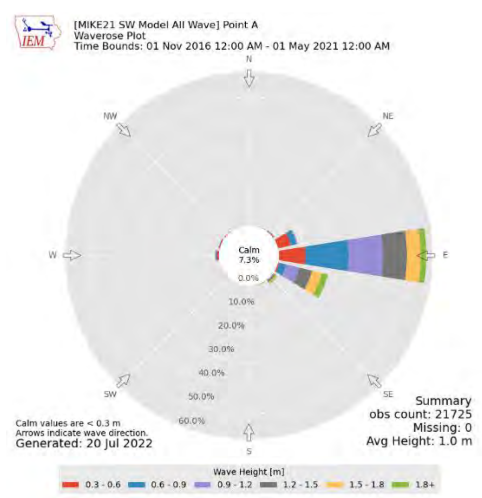


Figure 5.6 Model Results – November to April Wave Roses at Point A

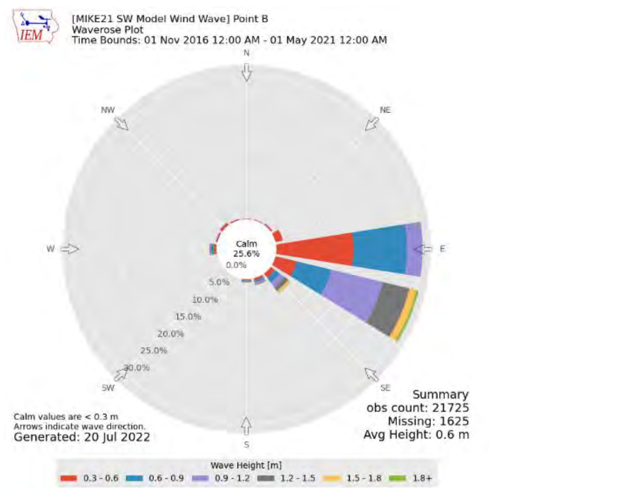
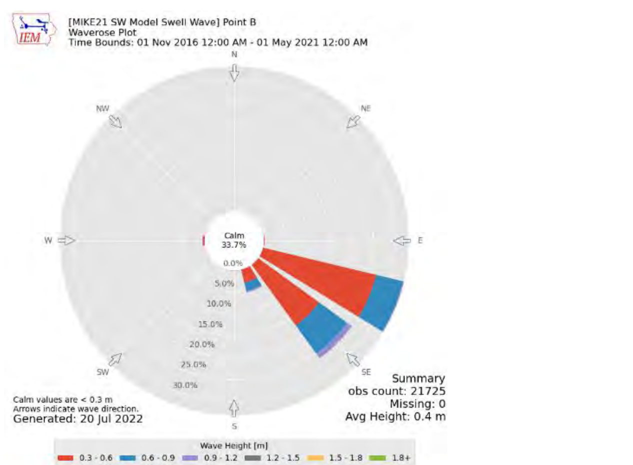
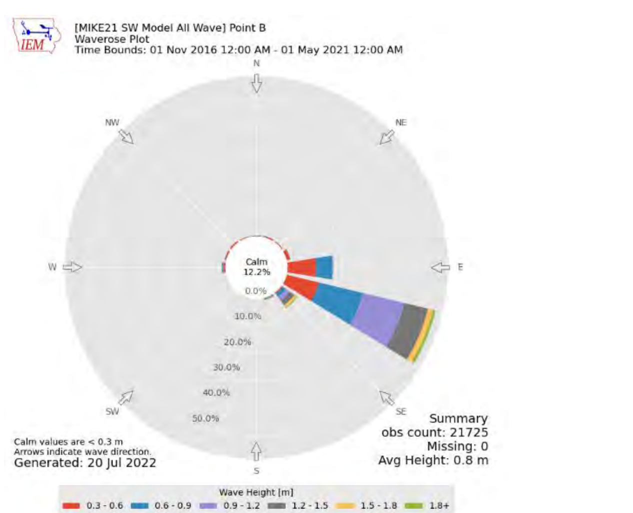
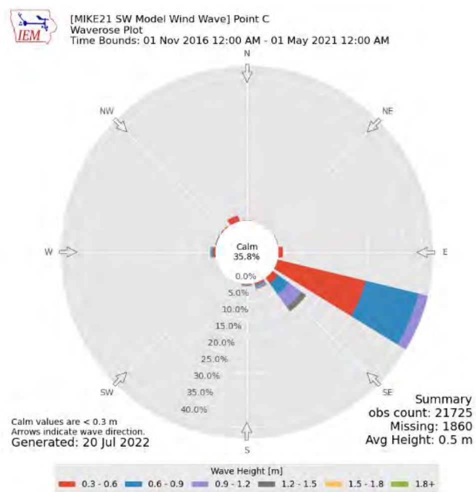
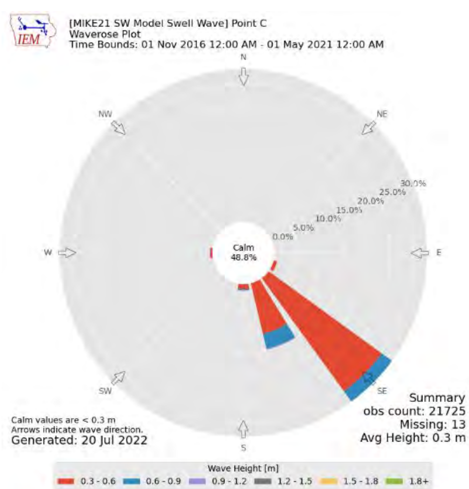
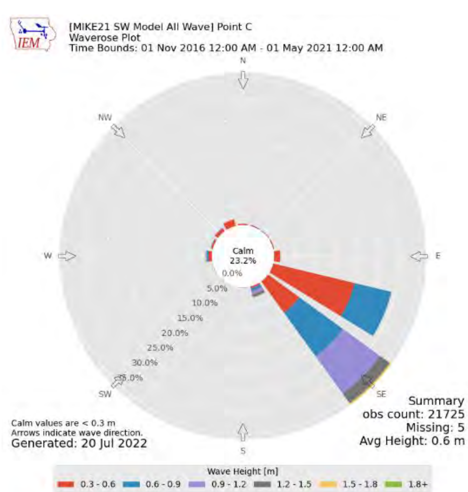
Wind Wave	
Swell	
All Wave	

Figure 5.7 Model Results – November to April Wave Roses at Point B

<table>
<tr><td>Wind Wave</td><td>
</td></tr>
<tr><td>Swell</td><td>
</td></tr>
<tr><td>All Wave</td><td>
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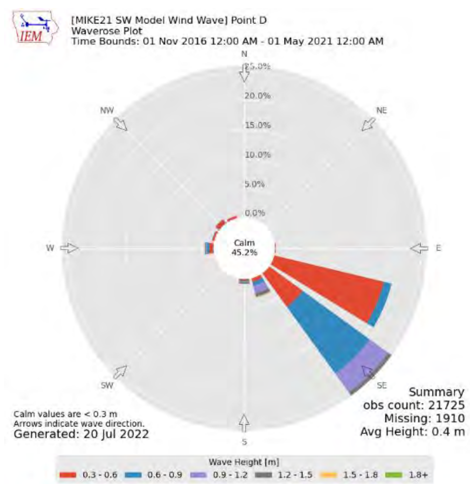
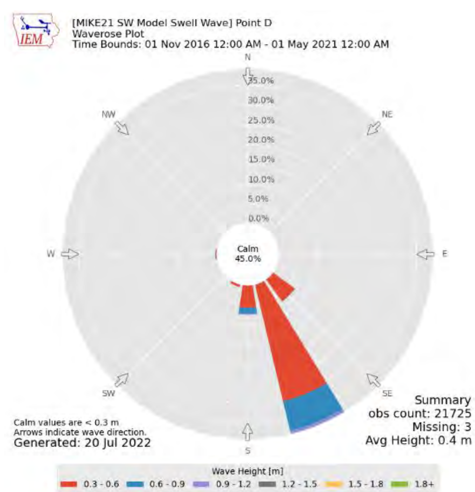
</table>

Figure 5.8 Model Results – November to April Wave Roses at Point C

Wind Wave



Swell



All Wave

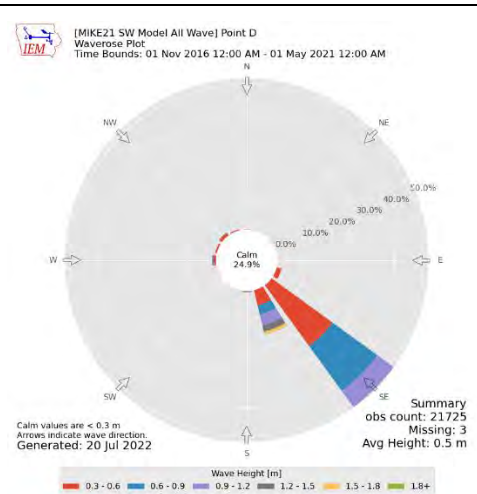


Figure 5.9 Model Results – November to April Wave Roses at Point D

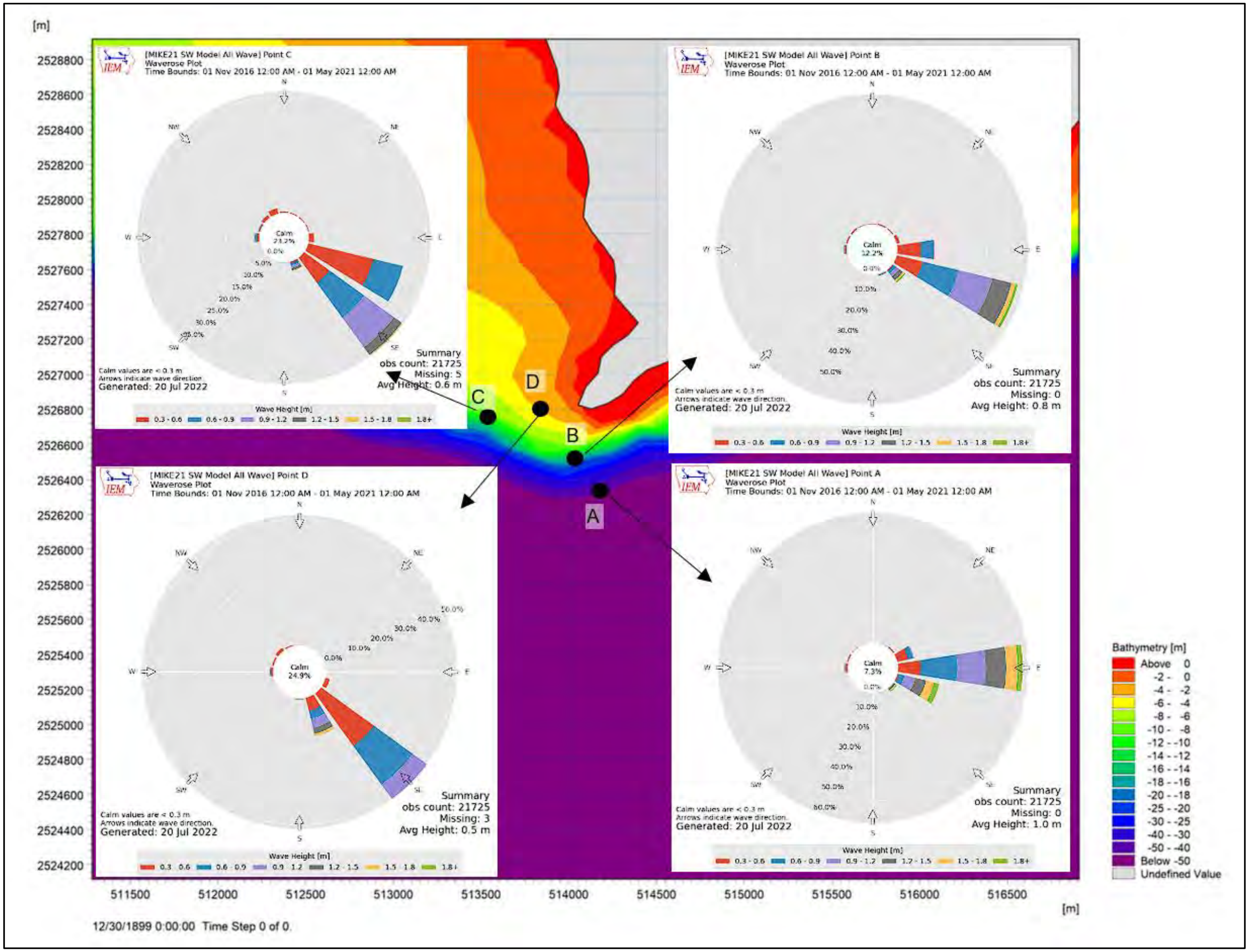


Figure 5.10 Comparisons of Wave Roses (All Wave) at Different Locations

The following findings are noted based on the above model results:

- Waves at Point A (40 m water depth) are mostly from the easterly direction. This point is an offshore location with greater exposure, and the waves are the highest among all four points, as expected.
- Waves at Point B (12 m water depth to the South) are mostly from the east-southeasterly direction. Wave height is slightly lower than Point A.
- Waves at Point C (12 m water depth to the West) are mostly from the southeasterly and east-southeasterly direction with significantly reduced wave height as compared to Point A and Point B.
- Waves at Point D (5 m water depth) are mostly from the southeasterly direction with significantly reduced wave height as compared to Point A and Point B

Sample wave time series at the four selected locations under the typical northeasterly and easterly offshore wave conditions in comparison with the offshore waves are presented in Figure 5.11 and Figure 5.12, respectively. These plots confirm that northeasterly offshore waves decrease more than the easterly offshore waves when arriving in the vicinity of the project site.

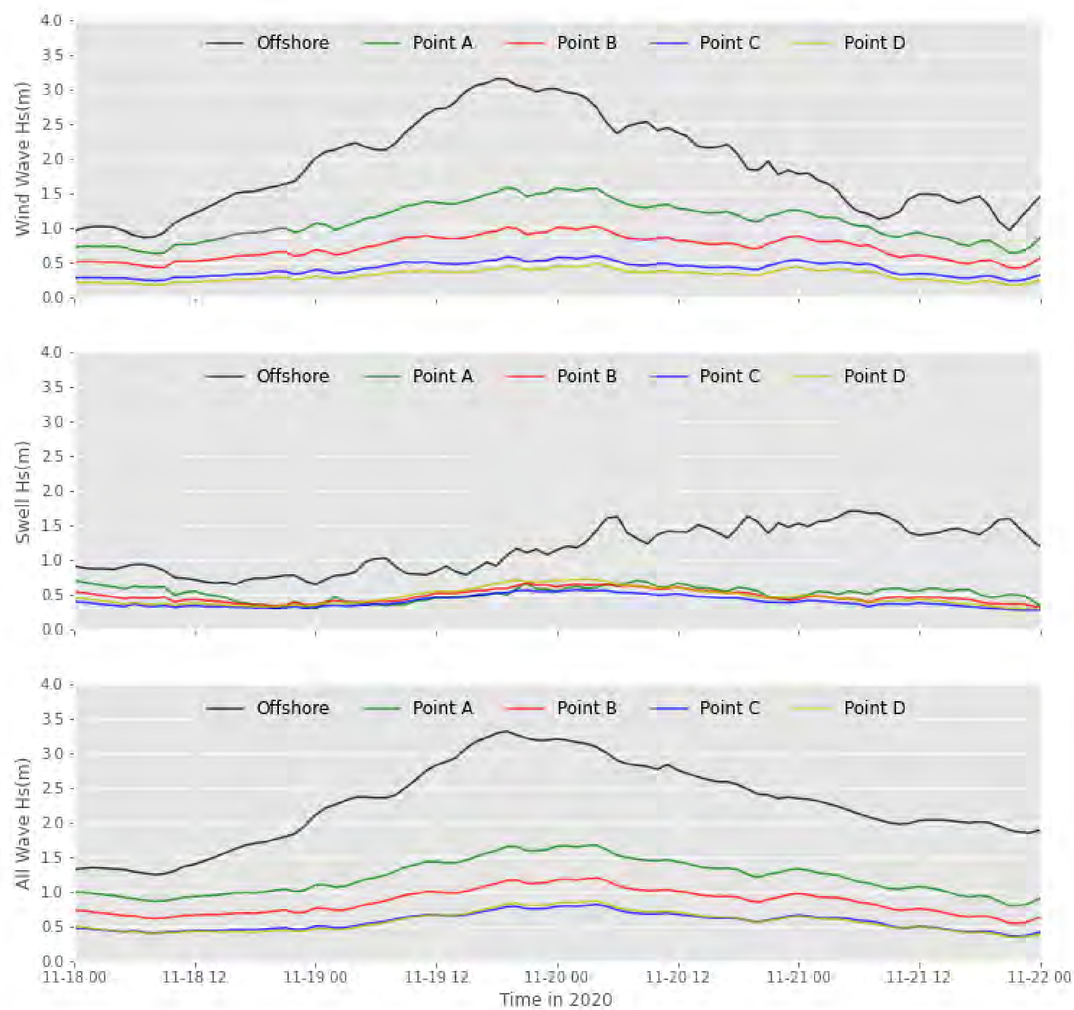


Figure 5.11 Comparison of Northeasterly Wave Time Series at Different Locations

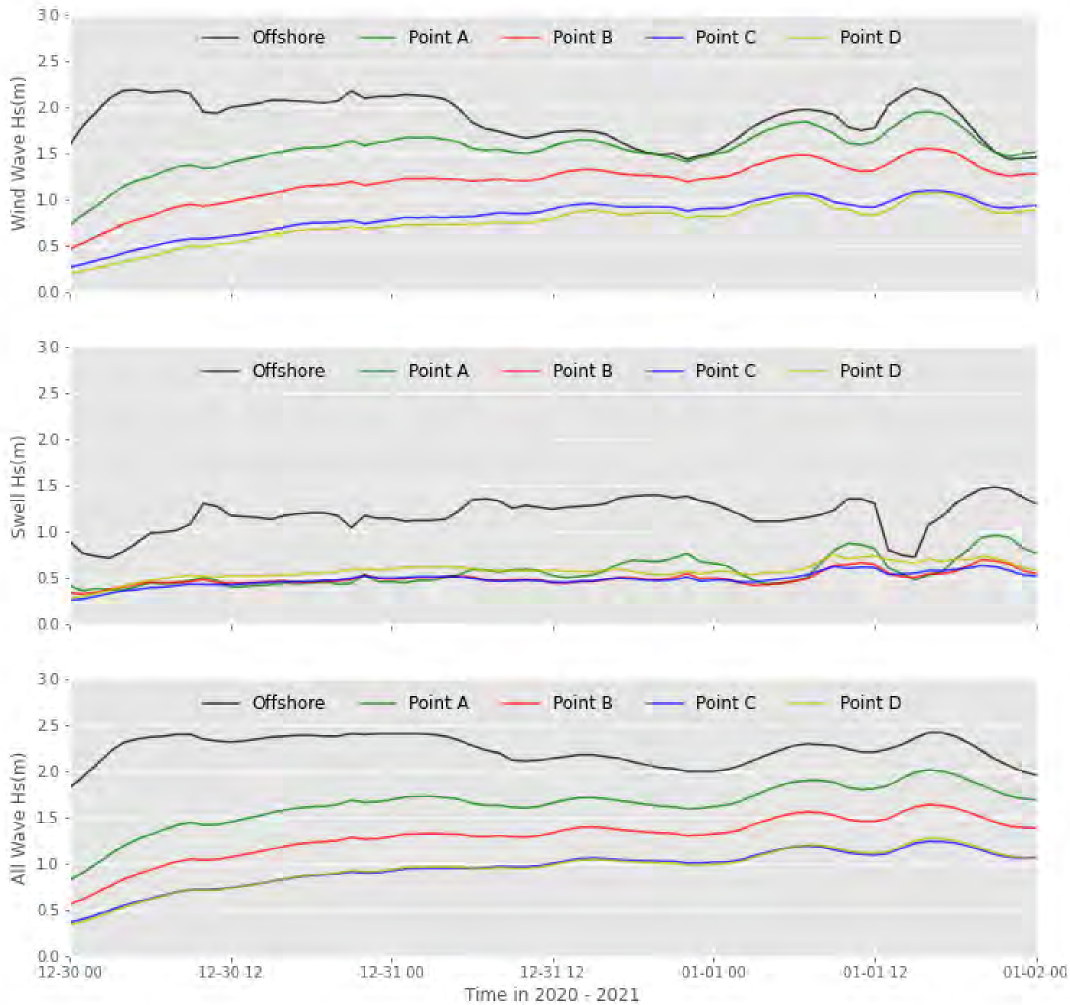


Figure 5.12 Comparison of Easterly Wave Time Series at Different Locations

5.3 Nearshore Wave Statistics

Based on the November to April time series wave modeling results, statistics on different wave height intervals and wave directions at four different locations in the project vicinity were obtained, as presented in Table 5.1, Table 5.2, Table 5.3, and Table 5.4, respectively. These statistics are based on the combined wind wave and swells.

Table 5.1 WAVE STATISTICS AT POINT A (NOVEMBER TO APRIL)

Dir	H_s (m)									Sub-Total
	0 - 0.3	0.3 - 0.6	0.6 - 0.9	0.9 - 1.2	1.2 - 1.5	1.5 - 1.8	1.8 - 2.1	2.1 - 2.4	2.4 - 2.7	
NE	0.56	0.48	0.03	0	0	0	0	0	0	1.07
ENE	2.6	5.69	1.6	0.08	0	0	0	0	0	9.97
E	3.22	14.38	18.57	13.2	7.2	2.58	0.34	0.19	0	59.68
ESE	0.14	1.2	4.69	5.84	4.99	2.07	0.9	0.35	0.01	20.18
SE	0.01	0.19	0.31	0.42	0.86	0.26	0.1	0.04	0	2.19
SSE	0.01	0.09	0.06	0.12	0.19	0.08	0.01	0	0	0.56

Table 5.2 WAVE STATISTICS AT POINT B (NOVEMBER TO APRIL)

Dir	H_s (m)								Sub-Total
	0 - 0.3	0.3 - 0.6	0.6 - 0.9	0.9 - 1.2	1.2 - 1.5	1.5 - 1.8	1.8 - 2.1	2.1 - 2.4	
NE	0.6	0.37	0	0	0	0	0	0	0.98
ENE	1.11	1.04	0.01	0	0	0	0	0	2.17
E	3.86	12.01	3.37	0.01	0	0	0	0	19.25
ESE	5.71	15.73	18.98	14.74	3.72	1.09	0.16	0	60.12
SE	0.56	0.91	1.8	2.35	1.52	0.42	0.1	0	7.66
SSE	0.12	0.19	0.22	0.32	0.31	0.03	0.01	0	1.21

Table 5.3 WAVE STATISTICS AT POINT C (NOVEMBER TO APRIL)

Dir	H_s (m)							Sub-Total
	0 - 0.3	0.3 - 0.6	0.6 - 0.9	0.9 - 1.2	1.2 - 1.5	1.5 - 1.8	1.8 - 2.1	
NE	0.71	0.19	0	0	0	0	0	0.9
ENE	0.83	0.26	0	0	0	0	0	1.09
E	1.72	1.01	0	0	0	0	0	2.73
ESE	8.85	21.68	4.72	0	0	0	0	35.25
SE	9.58	10.48	16.53	6.25	1.43	0.02	0	44.29
SSE	0.81	0.72	0.71	0.98	0.3	0.08	0.01	3.6

Table 5.4 WAVE STATISTICS AT POINT D (NOVEMBER TO APRIL)

Dir	H_s (m)							Sub-Total
	0 - 0.3	0.3 - 0.6	0.6 - 0.9	0.9 - 1.2	1.2 - 1.5	1.5 - 1.8	1.8 - 2.1	
NE	0.52	0.02	0	0	0	0	0	0.53
ENE	0.37	0.01	0	0	0	0	0	0.39
E	0.51	0.02	0	0	0	0	0	0.53
ESE	5	0.56	0	0	0	0	0	5.56
SE	10.91	29.14	17.21	2.27	0	0	0	59.54
SSE	6.18	5.64	3.58	3.74	1.57	0.17	0.01	20.9

The following findings are noted from the above statistical results:

- At Point A (40 m water depth offshore), waves are predominantly from the East, with significant wave height exceeding 1.5 m for 7% of the time.
- At Point B (12 m water depth to the South), waves are predominantly from the East-Southeast, with significant wave height exceeding 1.5 m for 2% of the time.
- At Point C (12 m water depth to the West), waves are predominantly from the Southeast and the East-Southeast, with significant wave height exceeding 1.5 m for 0.1% of time.
- At Point D (5 m water depth to the West), waves are predominantly from the Southeast, with significant wave height exceeding 1.5 m for 0.2% of time.

6. PRELIMINARY ASSESSMENT ON OPERATION DOWNTIME

There are several environmental factors that may cause operation downtime for the cruise ship terminal. These factors include:

- High wind speeds that may cause berthing difficulties and/or excessive mooring loads.
- Undesired current conditions that may cause berthing difficulties and/or excessive mooring loads.
- Excessive vessel motions due to waves.

A general rule-of-thumb to avoid these undesired environmental conditions is to avoid beam-on wind, beam-on current, and beam-on waves where wind, current, and wave directions are perpendicular to the longitudinal axis of the cruise ship. Beam-on wind and beam-on currents results in large wind and current loads on the vessel due to the large projected wind area and current area, and these large environmental loads are transferred to mooring lines and may cause excessive mooring loads.

A typical cruise ship does not respond to wind waves because wind waves have short wave periods, and they typically won't agitate a large vessel. Swell waves with long periods, however, are known to cause excessive vessel motions, especially in a beam-on condition. Excessive vessel motions not only introduce uncomfortable conditions for people on the vessel, but also introduce berthing difficulties and high risk of mooring line failure. Therefore, swell wave amplitudes and directions are critical to dynamic vessel motions.

Berth occupancy time is also an important factor. Environmental conditions need to be benign continuously during the entire duration of the berth occupancy for safe operation. The longer the vessel occupies the berth, the more down time of operation it may introduce. Because of this, the exceeding probabilities of wind and waves cannot be used as downtime directly.

A preliminary assessment on operation downtime at three possible berth locations (Point B, Point C and Point D) was carried out, as summarized in Table 6.1. Based on our extensive engineering experience and wind and wave statistical results, it's our judgement that the estimated operation downtime at Point B, Point C and Point D is 5% to 10%, 1% to 2%, and 1% to 2%, respectively. To minimize operation downtime, a cruise terminal at Point C or Point D is desired.

Table 6.1 PRELIMINARY ASSESSMENT OF OPERATION DOWNTIME

Description	Point B	Point C	Point D
Location	At 12 m water depth to the South	At 12 m water depth to the West	At 5 m water depth to the West (dredging required)
Wind	Predominantly blowing from E and NE during the winter season.		
Current	Offshore ocean current flowing towards Northwest. Local tidal current subject to further investigation.		
Wave	Mainly from ESE 2% exceedance when H_s>1.5 m	Mainly from SE and ESE 0.1% exceedance when H_s > 1.5 m	Mainly from SE 0.2% exceedance when H_s > 1.5 m
Berthing	Higher waves may cause berthing difficulties.	Berthing difficulties unlikely under normal conditions	Berthing difficulties unlikely under normal conditions
Vessel Motion	Beam-on swell waves may cause excessive vessel motion	Excessive vessel motion unlikely under normal conditions	Excessive vessel motion unlikely under normal conditions
Mooring Loads	Excessive vessel motion may introduce high mooring loads	Excessive mooring loads unlikely under normal conditions	Excessive mooring loads unlikely under normal conditions
Downtime Estimate	5% to 10%	1% to 2%	1% to 2%

7. CONCLUSIONS AND RECOMMENDATIONS

This coastal engineering report summarizes the results and findings of the coastal engineering study on the proposed cruise ship terminal project at Long Island, Bahamas. The offshore wind and wave statistical analysis was carried out based on the 43-year (1979 to 2021) ERA5 wind and wave data at an offshore grid point (23°N, 74°45'W) which is approximately 12 miles northeast of the project site. A hurricane extreme probability analysis was carried out based on the 170-year tropical storm and hurricane track record to determine the long-term design hurricanes. A wave propagation numerical modeling was conducted to assess the wave climate in the project vicinity. The model simulations focused on the winter season which is the prime cruise season with stronger winds and higher waves. A 6-month model simulation from November to April was carried out for each of the five years from 2016 to 2021. Model results at four different locations in the project vicinity were extracted and processed to obtain the nearshore wave statistics.

The following conclusions have been obtained:

- The wind statistical results show that predominant wind directions are from S, ENE and ESE directions. Winds are much stronger during the months from October to April as compared to the months from May to September.
- The offshore wave statistical results show that the predominant wind waves are from E, ENE and ESE directions, while the predominant swell waves are from E, ENE and NE directions. Both wind waves and swell waves are much higher during the months from October to April as compared to the months from May to September.
- The project site is prone to tropical storms and hurricanes. A total of 30 hurricanes have passed through within 60 nautical miles from the project site in the past 170 years. The 100-year design hurricane has maximum 1-minute wind speed of 136.4 knots.
- The wave propagation modeling results show that offshore wave heights decrease when arriving at the project site. Waves at deeper water to the South are higher due to greater exposure to the open sea, while waves at shallower water to the West of the project site are lower. Wave roses and statistics at four different locations in the project vicinity are presented in Section 5 of this report.
- A preliminary downtime assessment was carried out. The estimated operation downtime during the winter months at Point B, Point C and Point D is 5% to 10%, 1% to 2%, and 1% to 2%, respectively. To minimize operation downtime, a berth location to the West at Point C (12 m water depth) or Point D (5 m water depth) is desired.

The following recommendations are made:

- **Tidal Current Investigation**: Conduct tidal current measurement at the project site to obtain tidal current information.
- **Wave Measurement**: Carry out field wave measurements during the winter months at the project site to verify and validate the wave numerical modeling results. The measurement results can also be used to calibrate the wave model if needed.
- **Cruise Terminal Location**: To minimize operation downtime, the berth location should be placed at a location where wave heights are minimal. The findings of this study show that the desired location of berth is at Point C or Point D.

Appendix A

Offshore Wave Time Series Plots

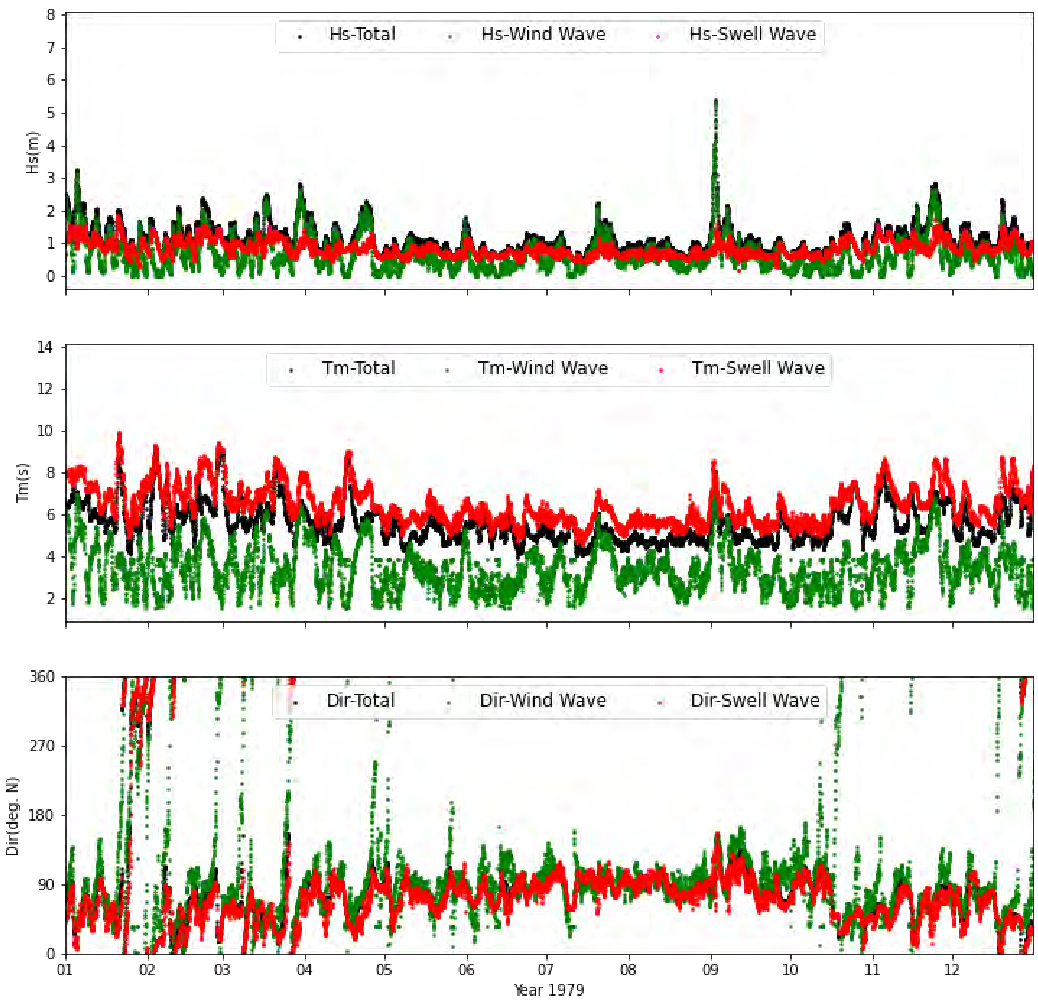


Figure A- 1 Wave Time Series – 1979

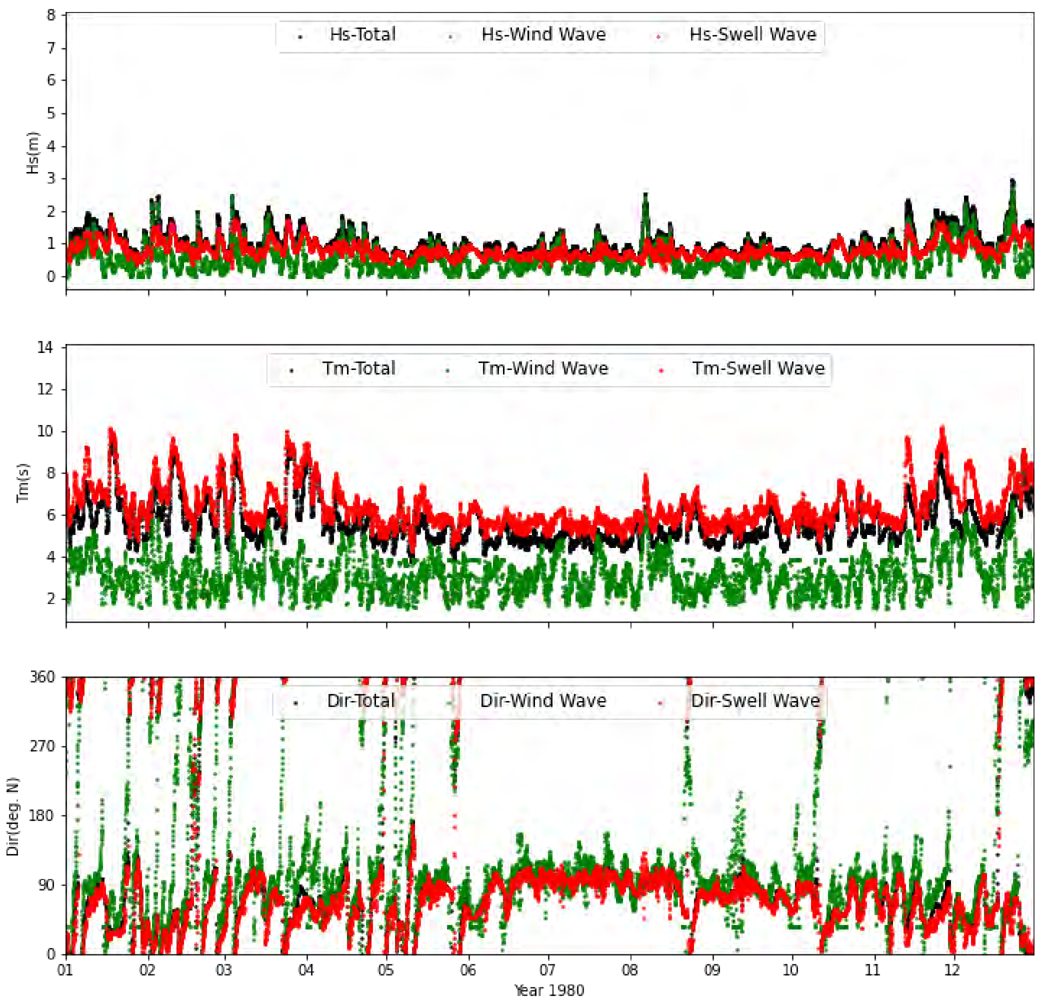


Figure A- 2 Wave Time Series – 1980

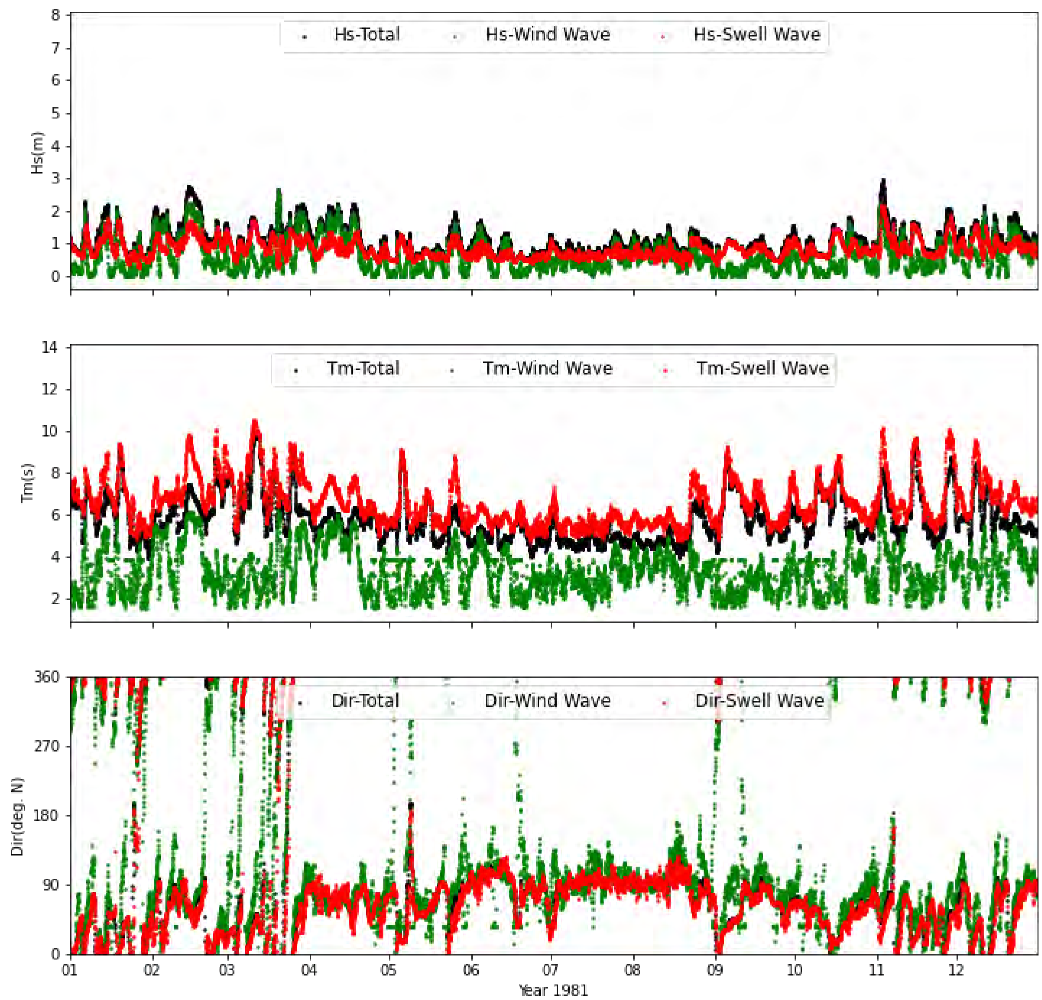


Figure A- 3 Wave Time Series – 1981

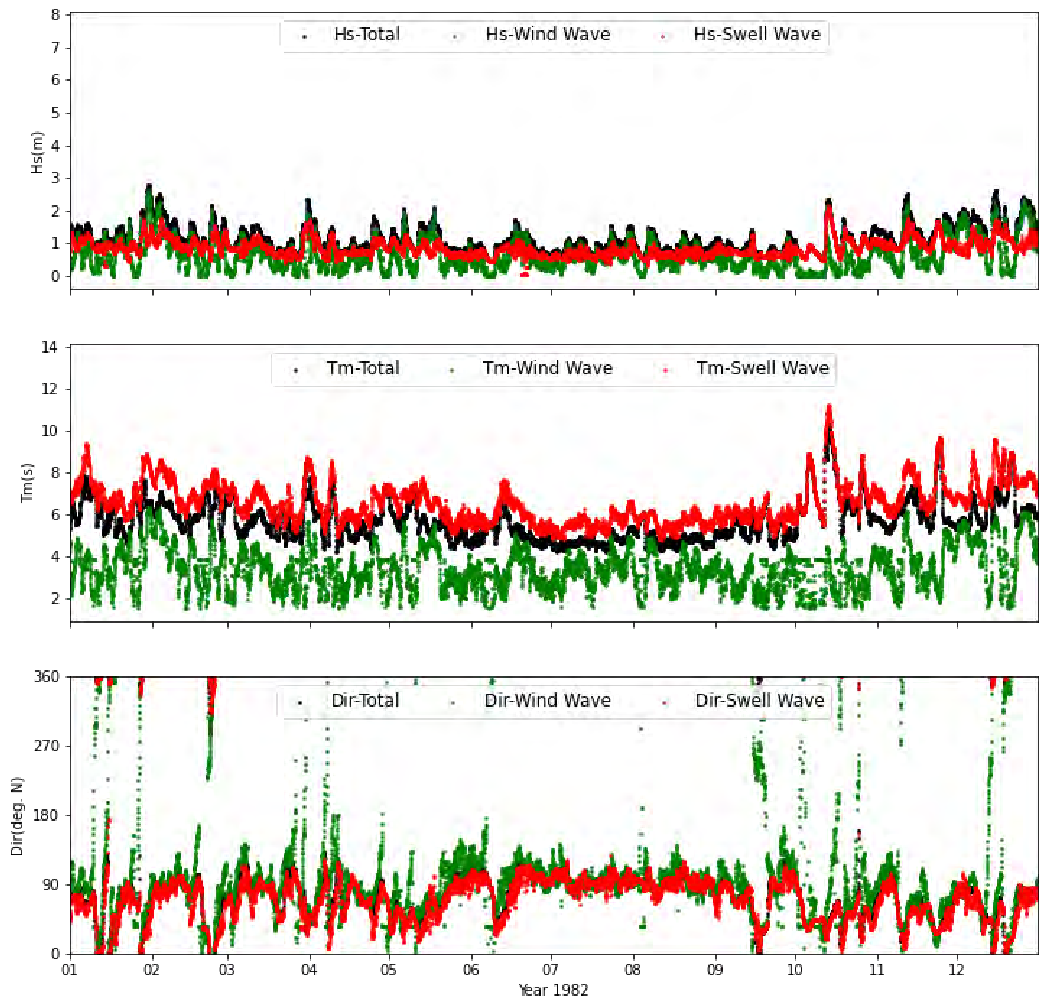


Figure A- 4 Wave Time Series – 1982

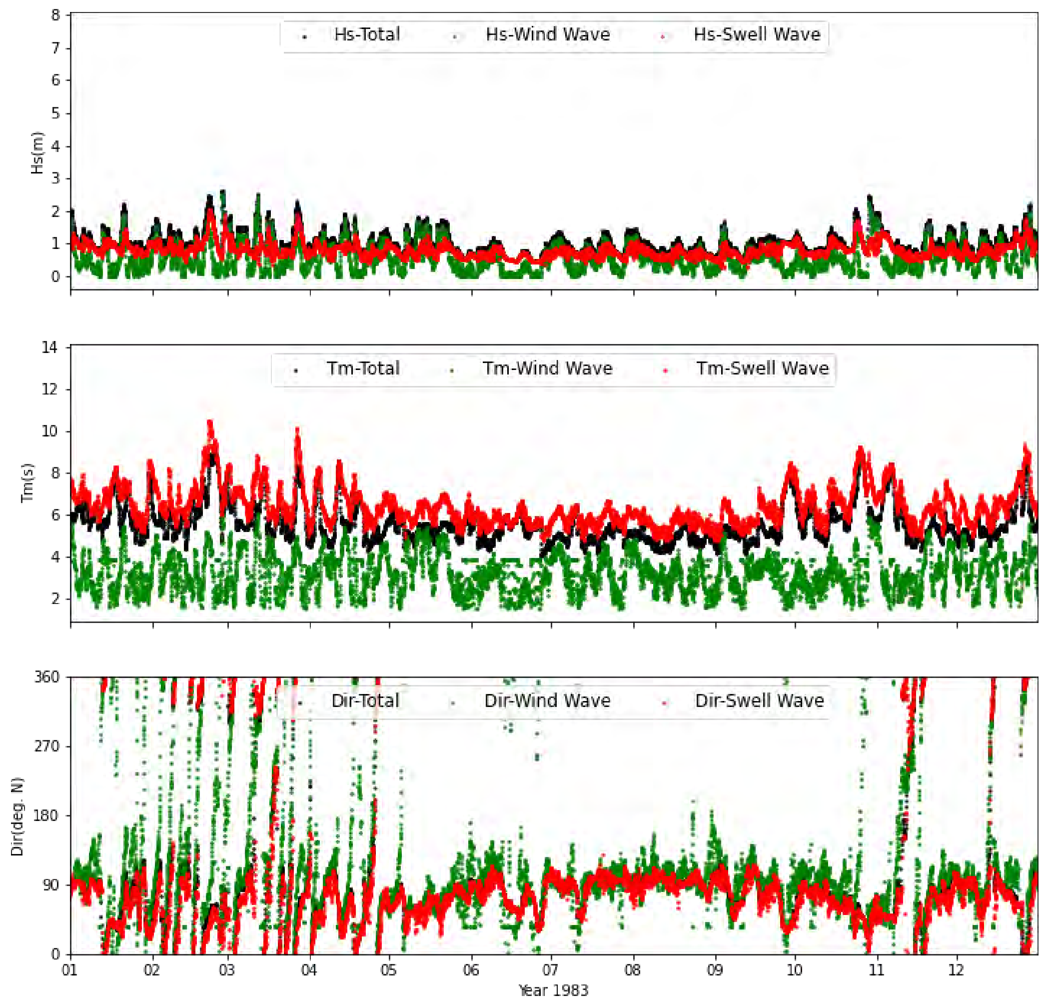


Figure A- 5 Wave Time Series – 1983

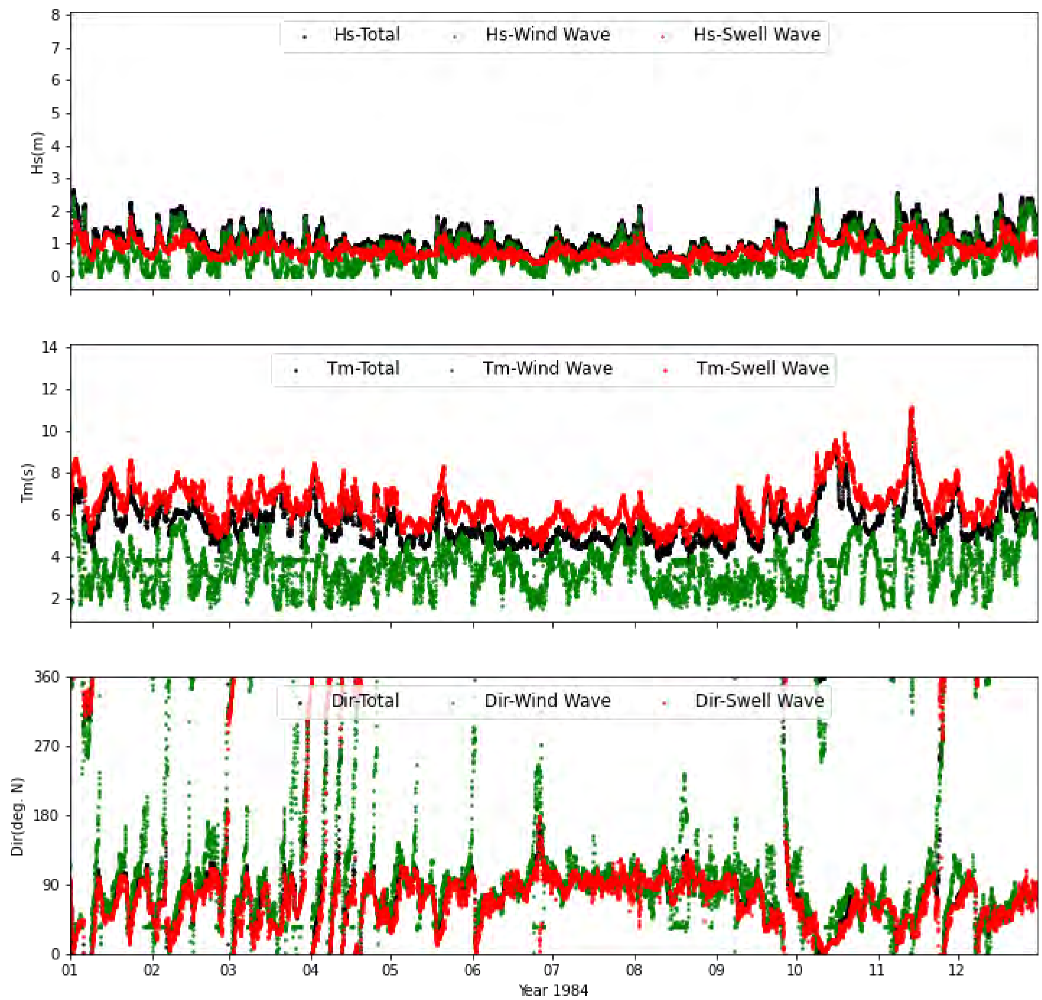


Figure A- 6 Wave Time Series – 1984

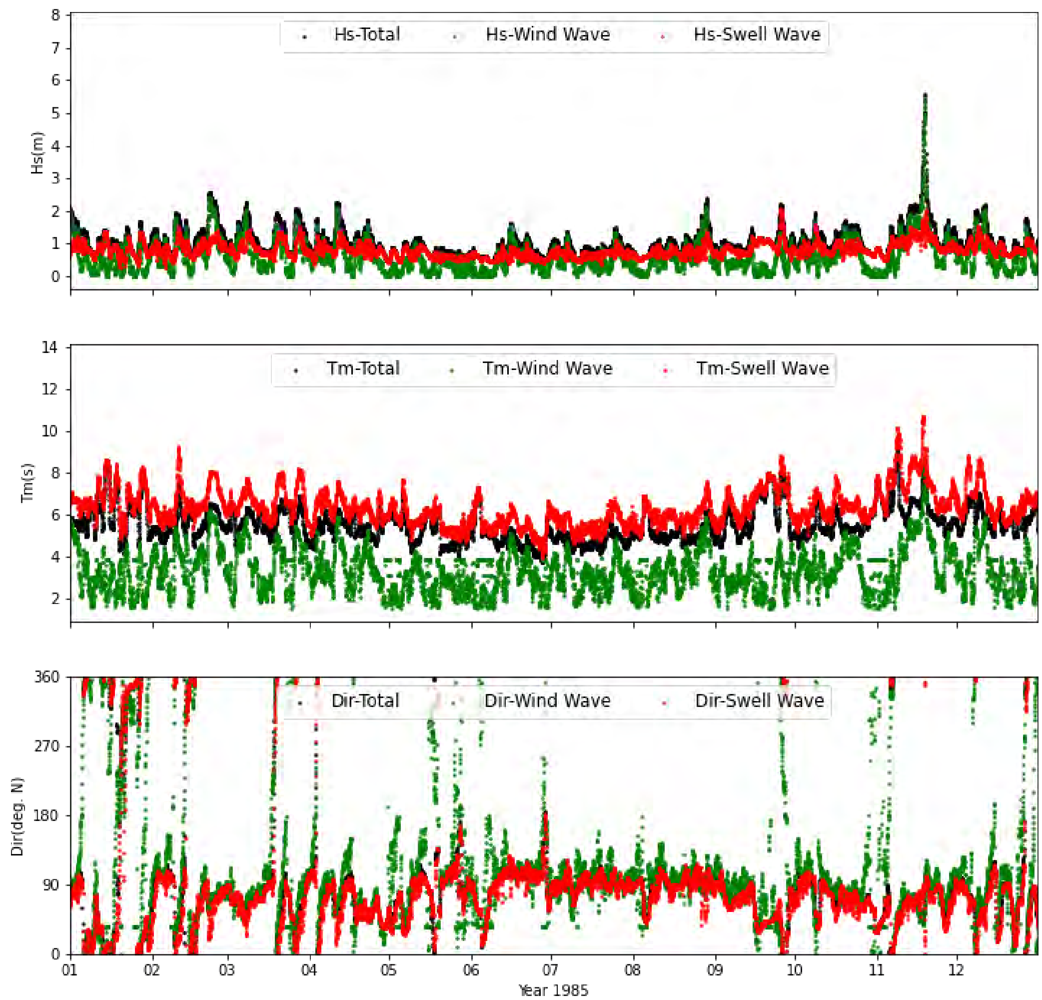


Figure A- 7 Wave Time Series – 1985

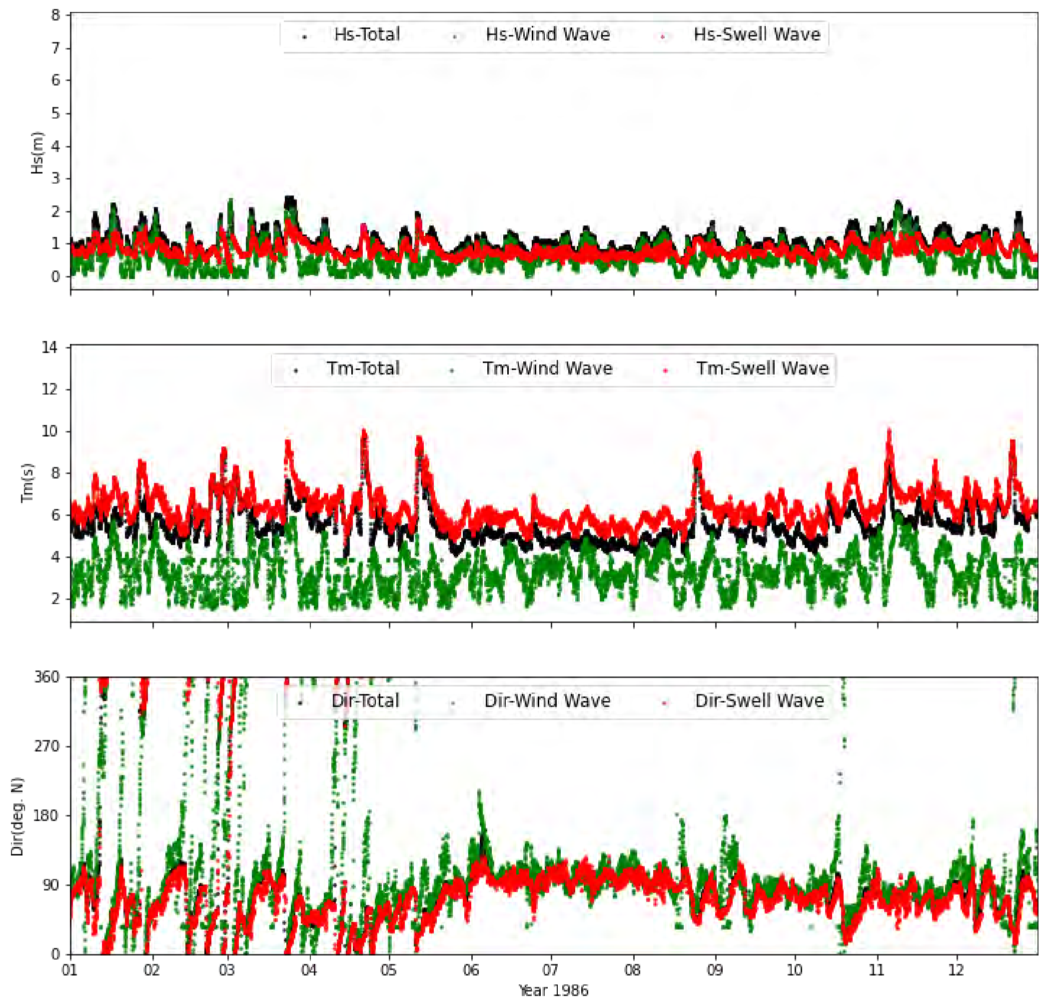


Figure A- 8 Wave Time Series – 1986

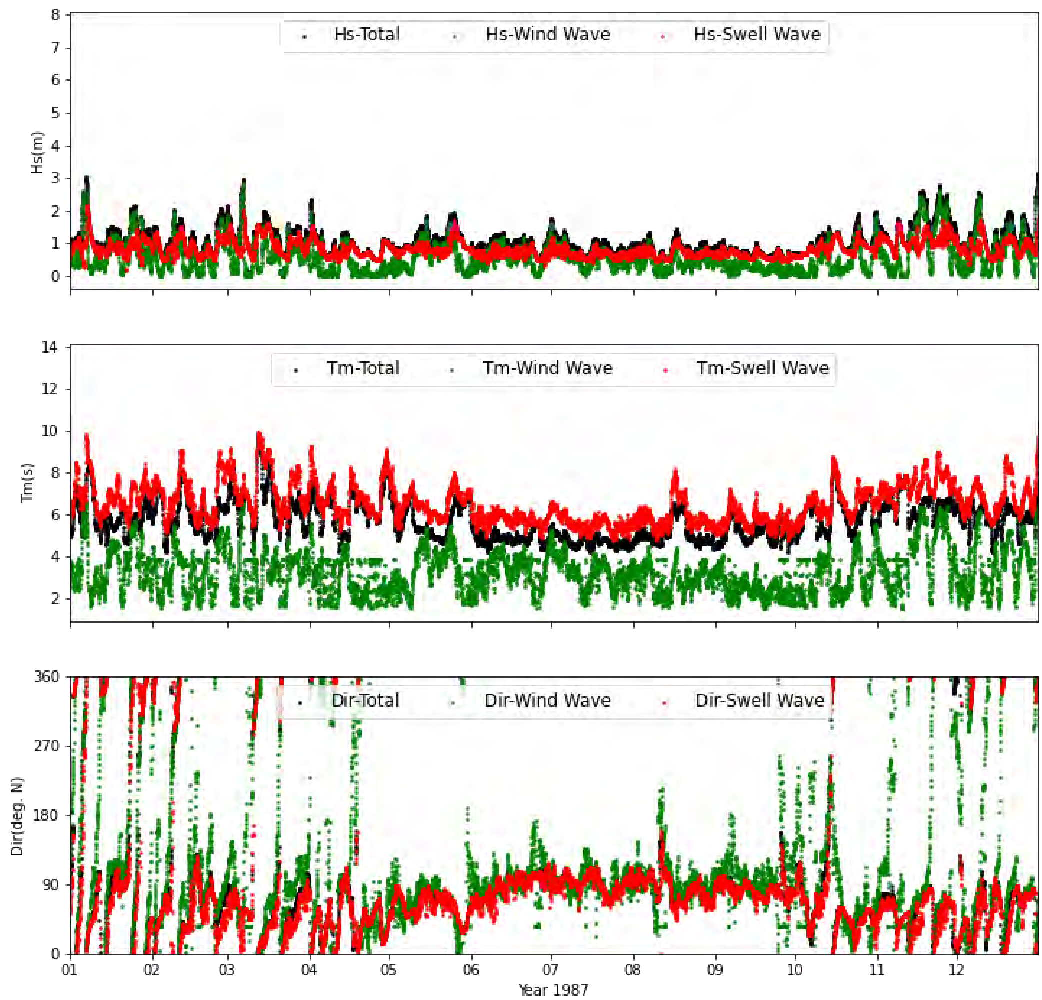


Figure A- 9 Wave Time Series – 1987

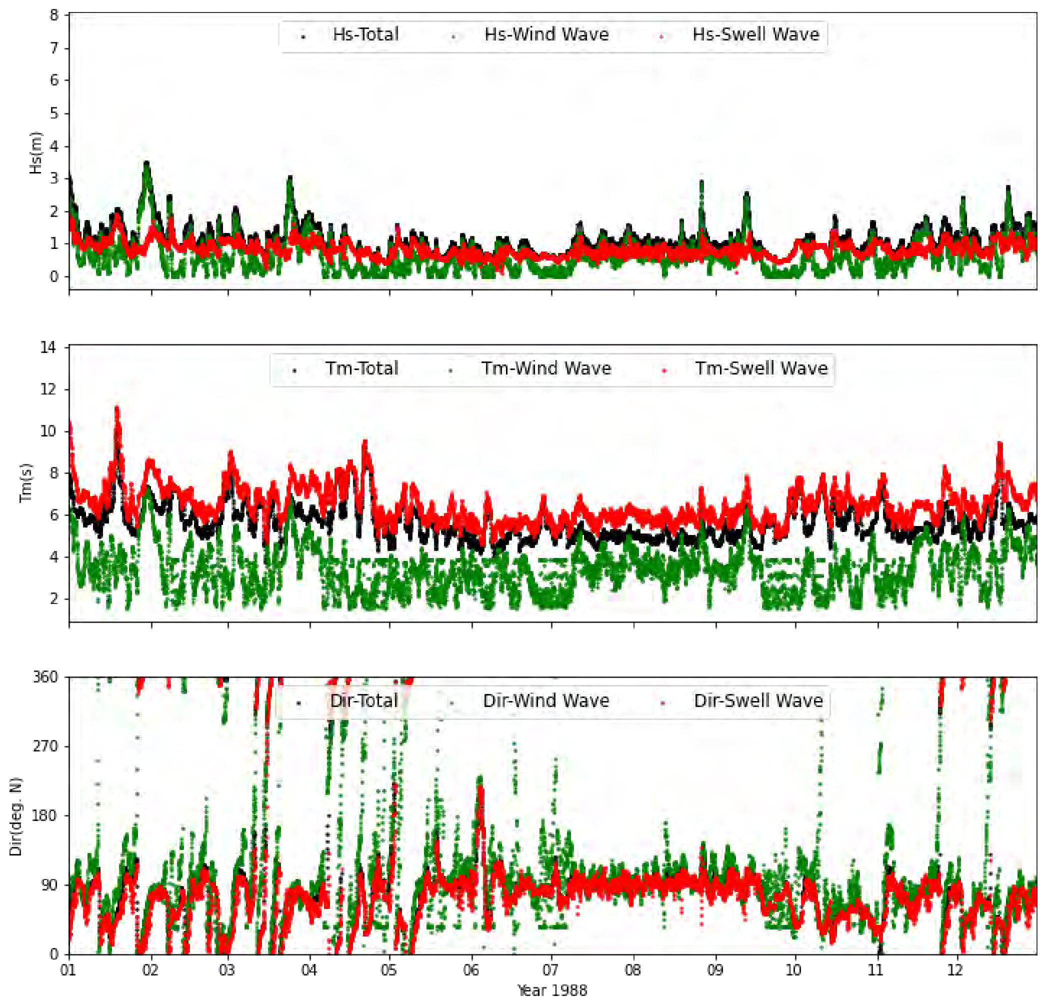


Figure A- 10 Wave Time Series – 1988

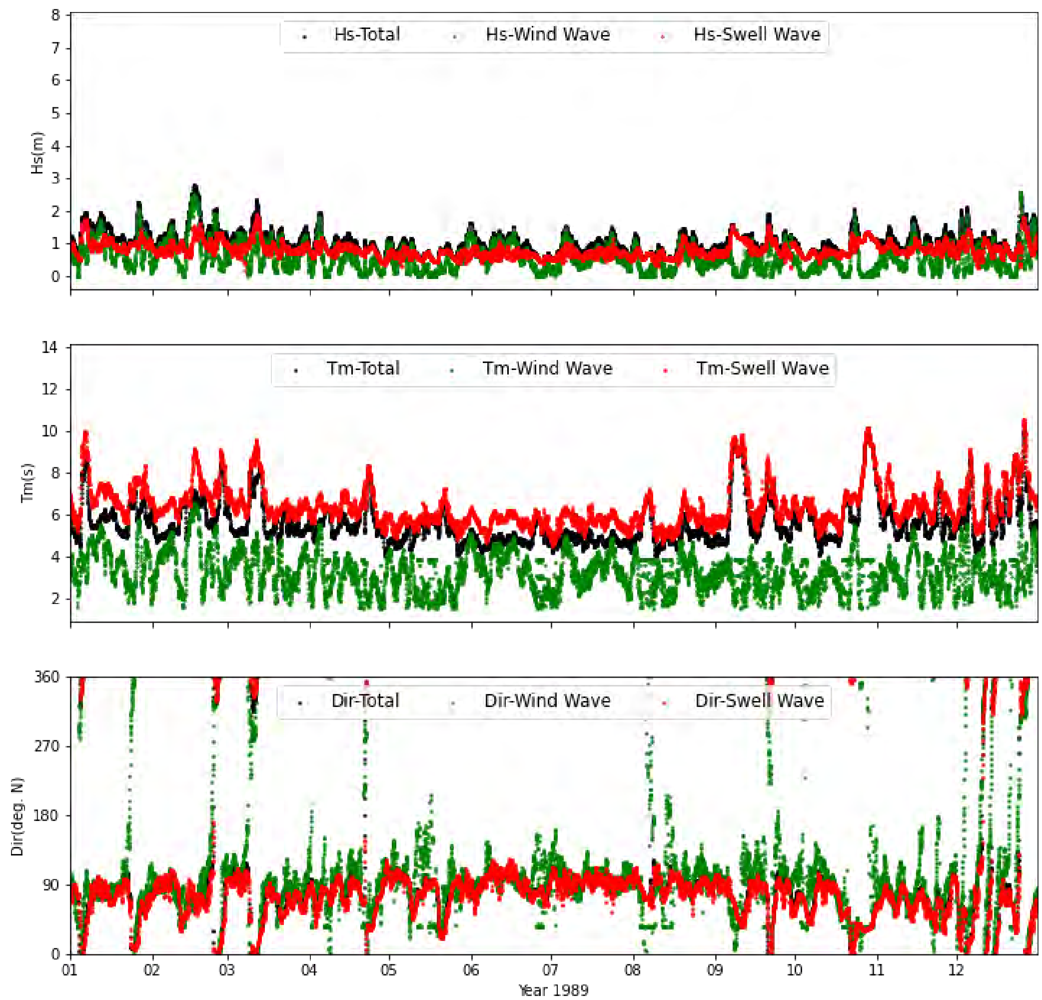


Figure A- 11 Wave Time Series – 1989

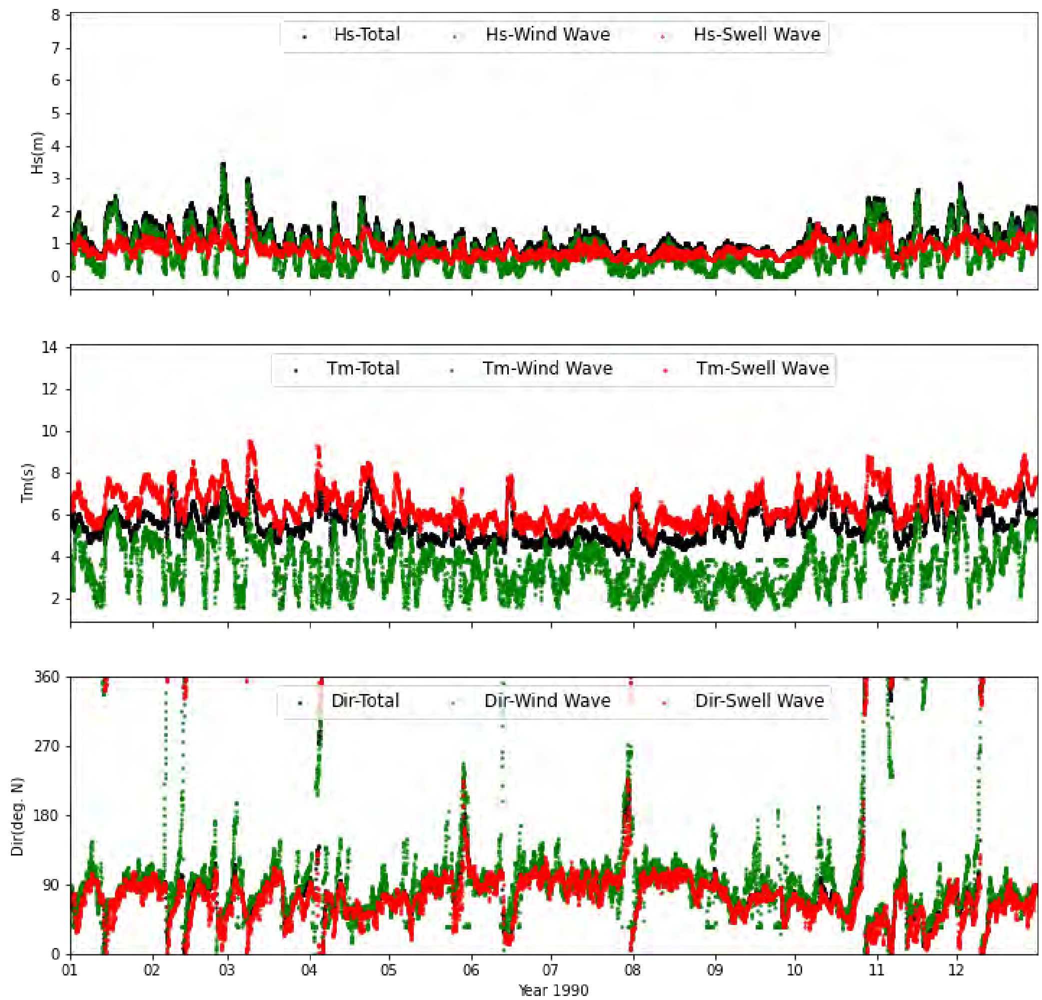


Figure A- 12 Wave Time Series – 1990

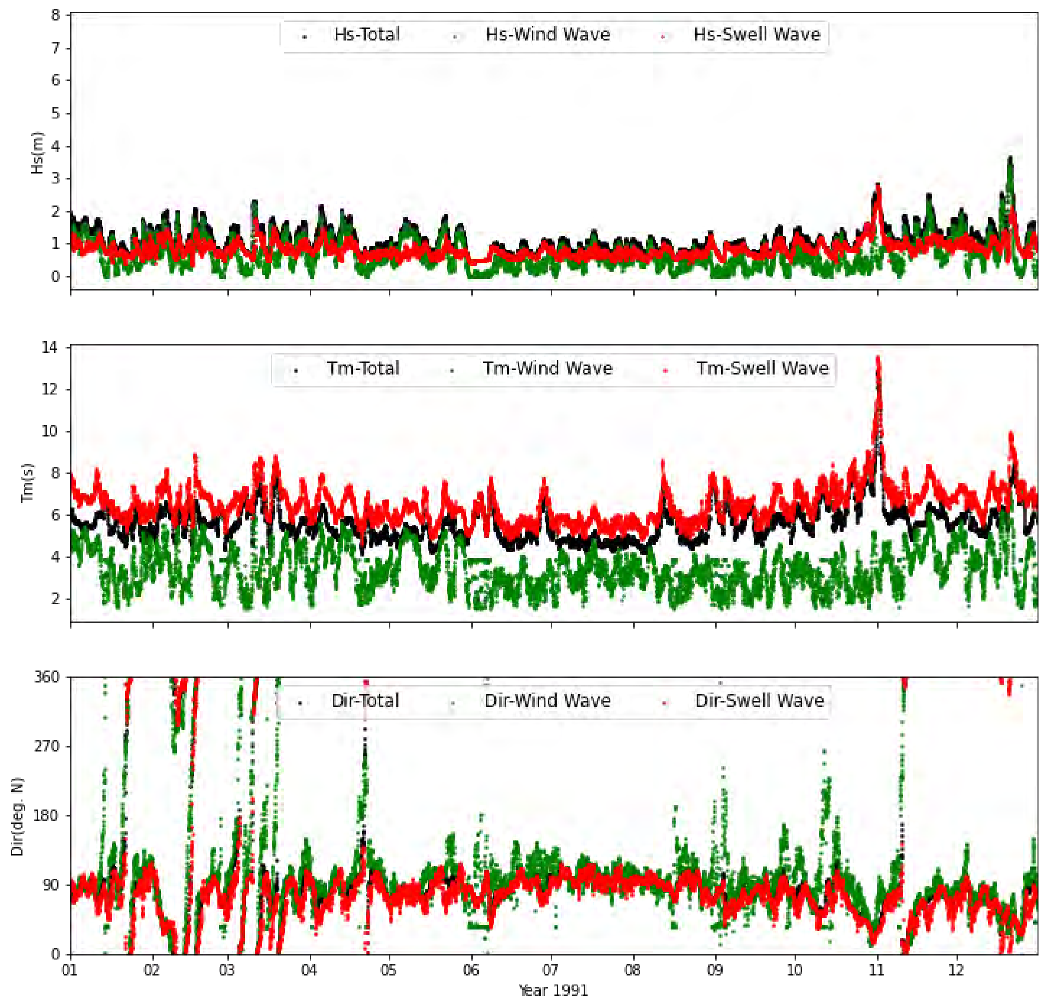


Figure A- 13 Wave Time Series – 1991

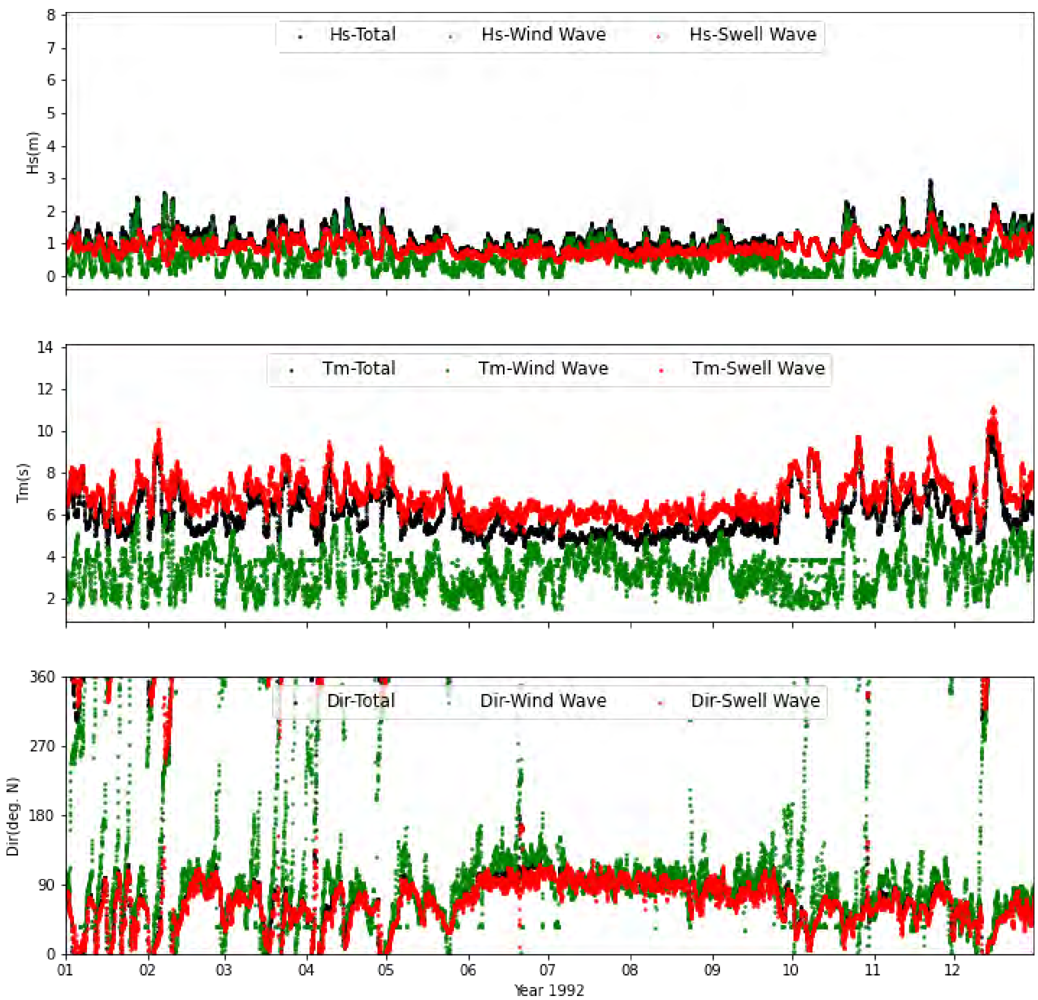


Figure A- 14 Wave Time Series – 1992

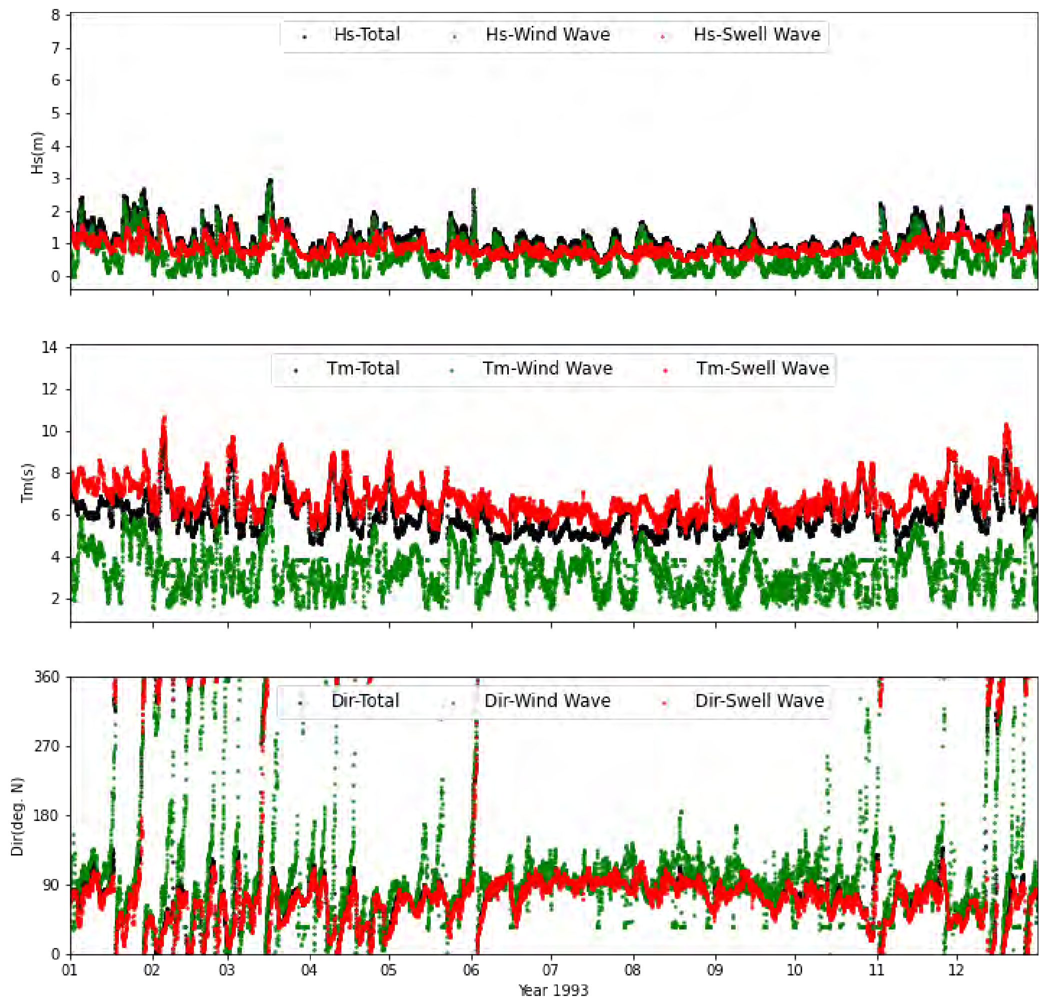


Figure A- 15 Wave Time Series – 1993

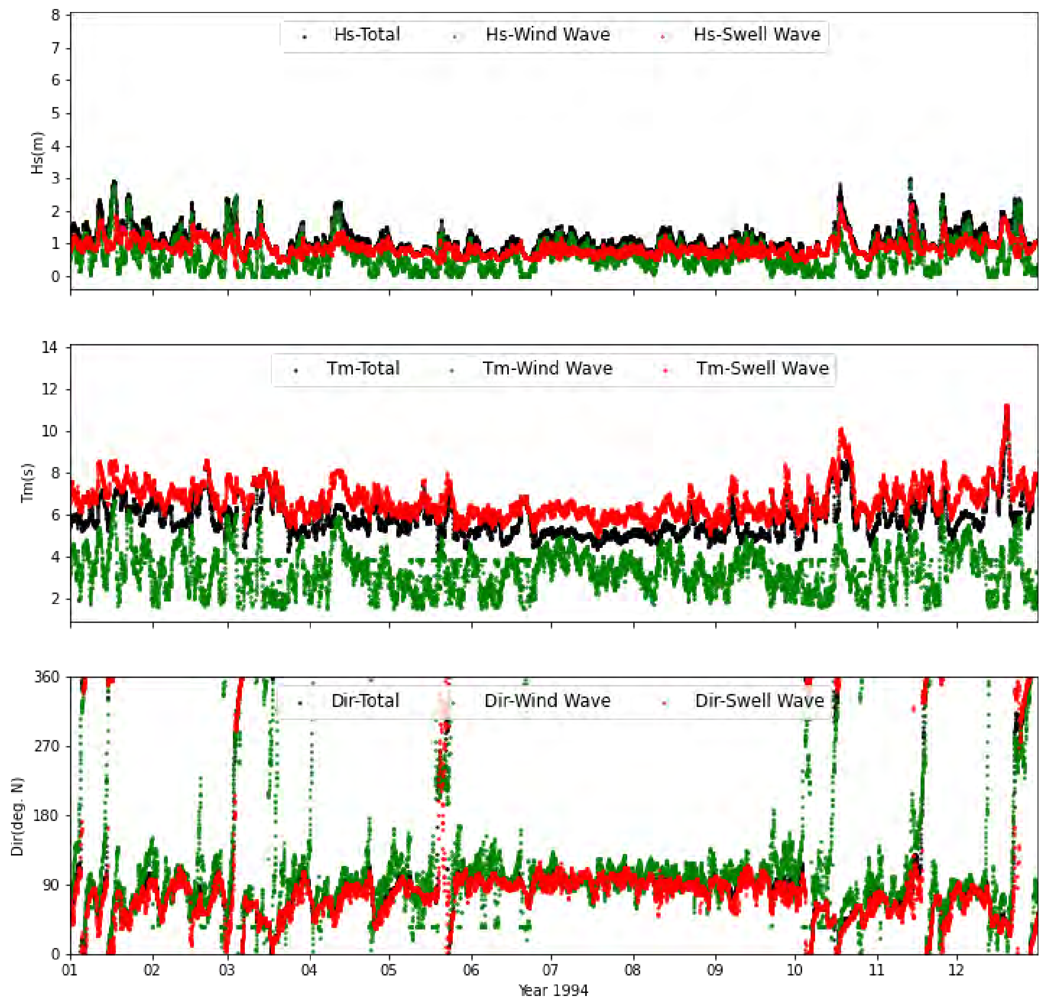


Figure A- 16 Wave Time Series – 1994

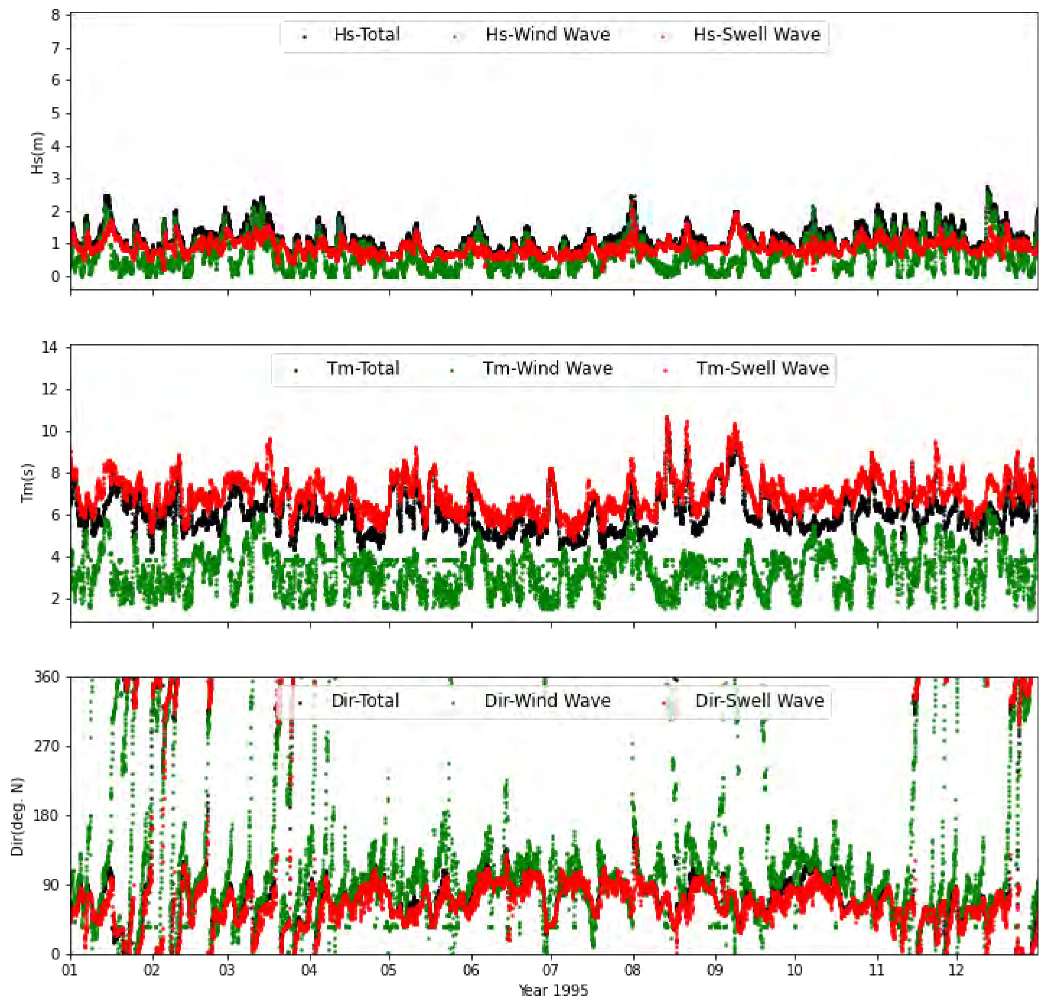


Figure A- 17 Wave Time Series – 1995

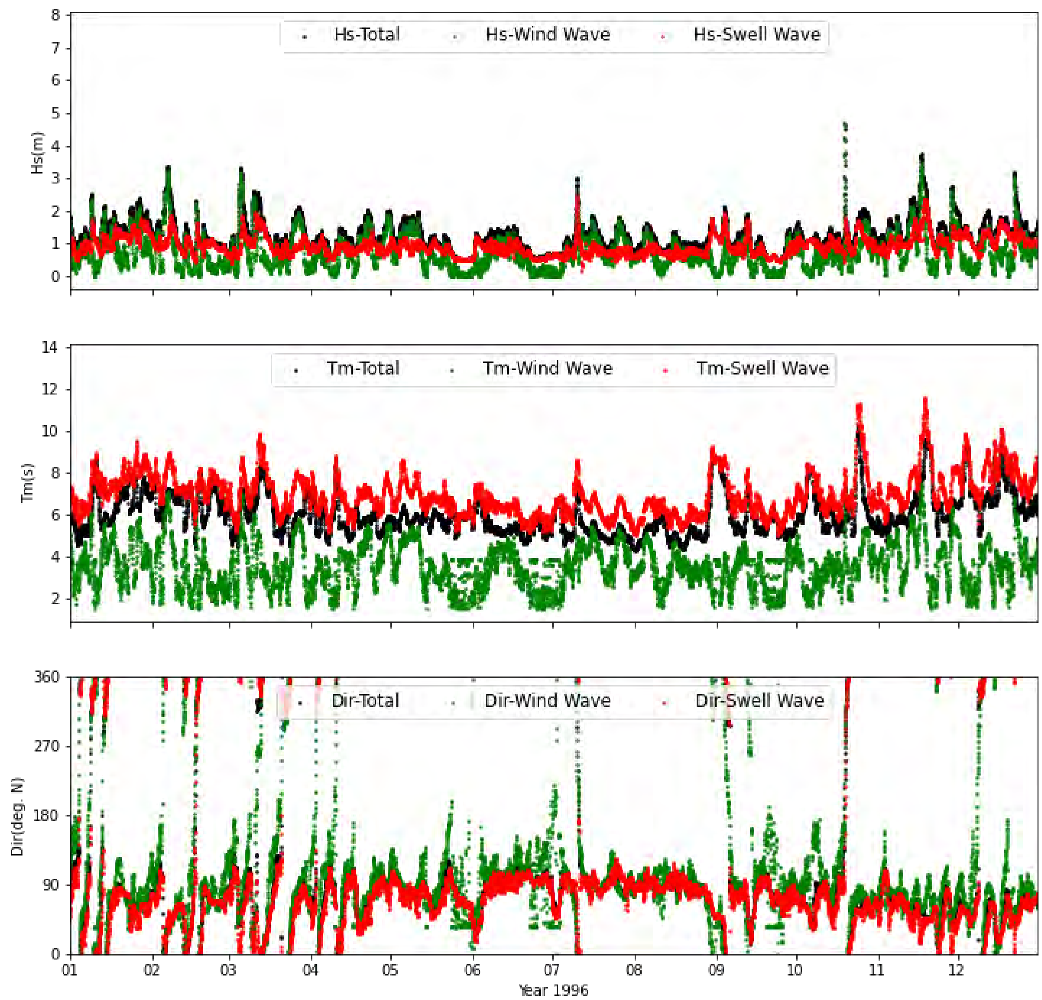


Figure A- 18 Wave Time Series – 1996

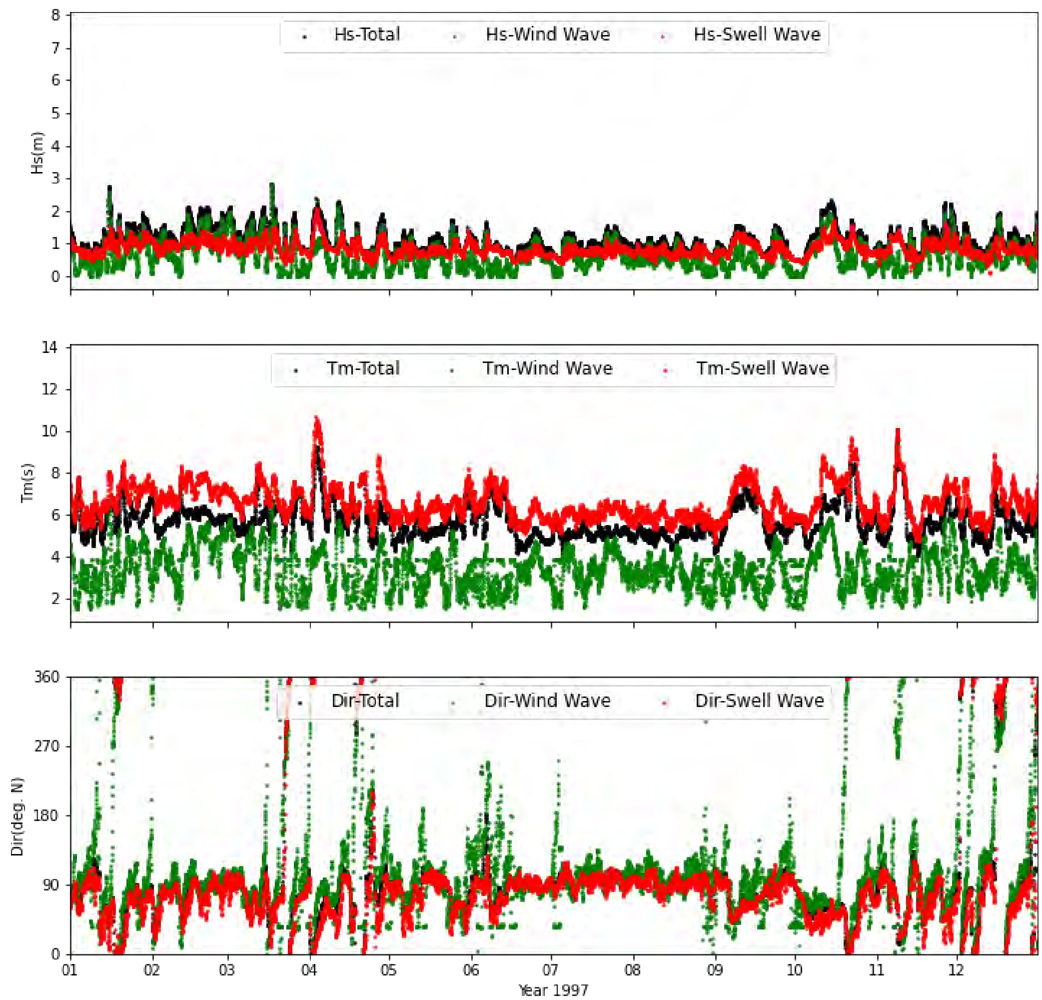


Figure A- 19 Wave Time Series – 1997

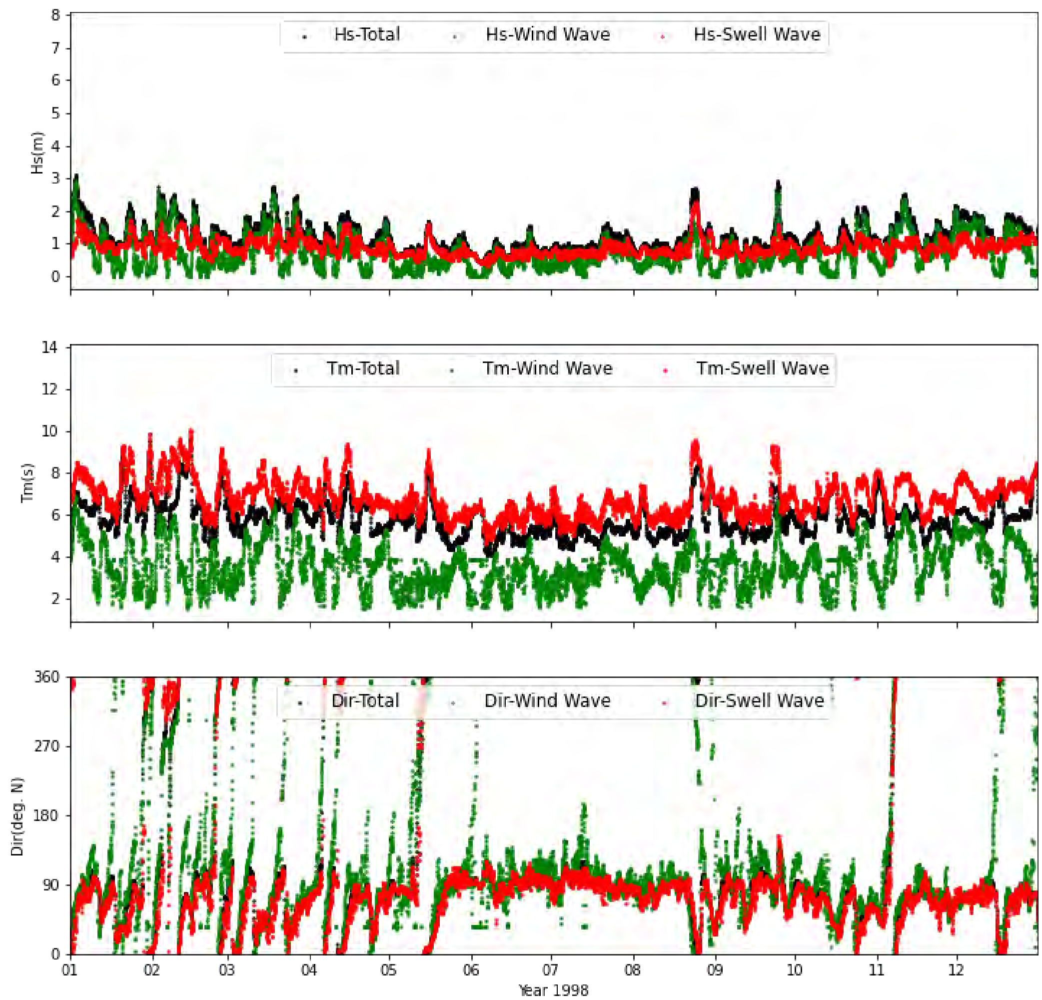


Figure A- 20 Wave Time Series – 1998

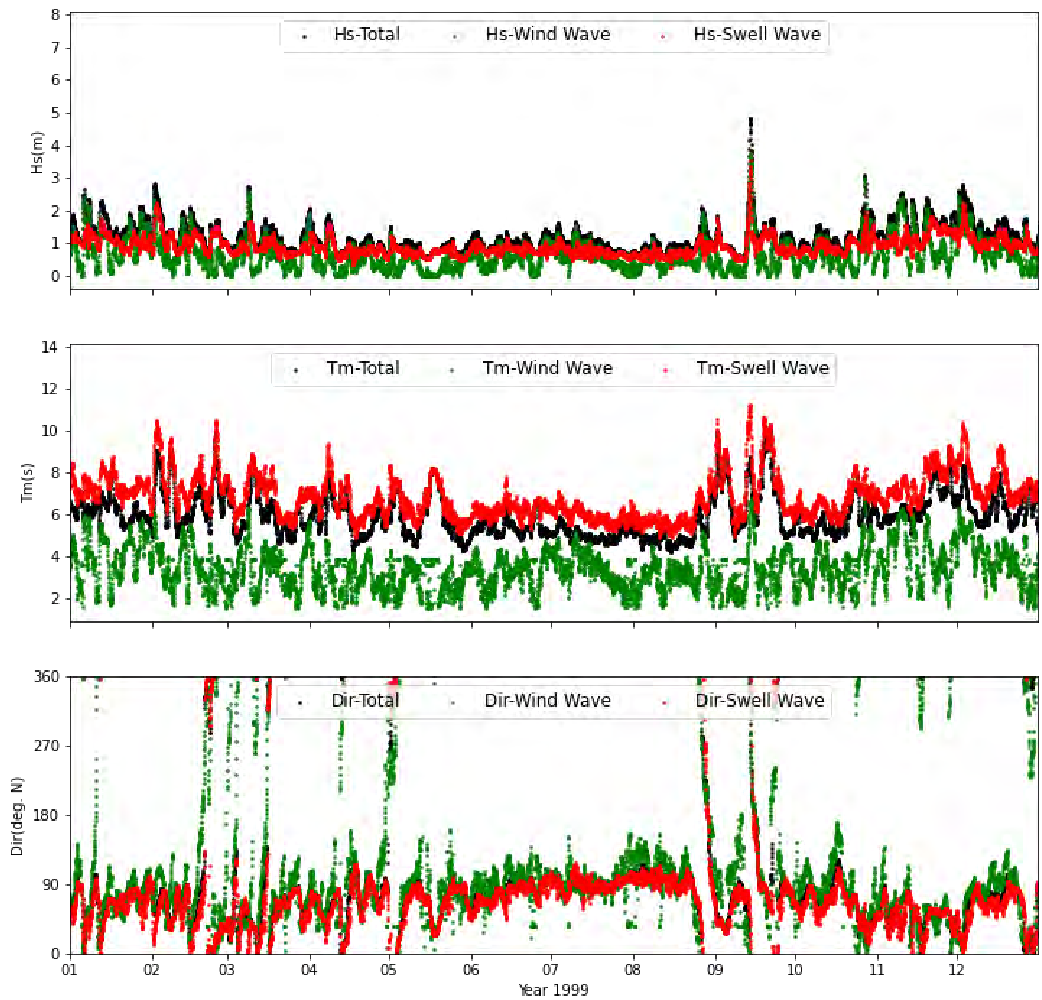


Figure A- 21 Wave Time Series – 1999

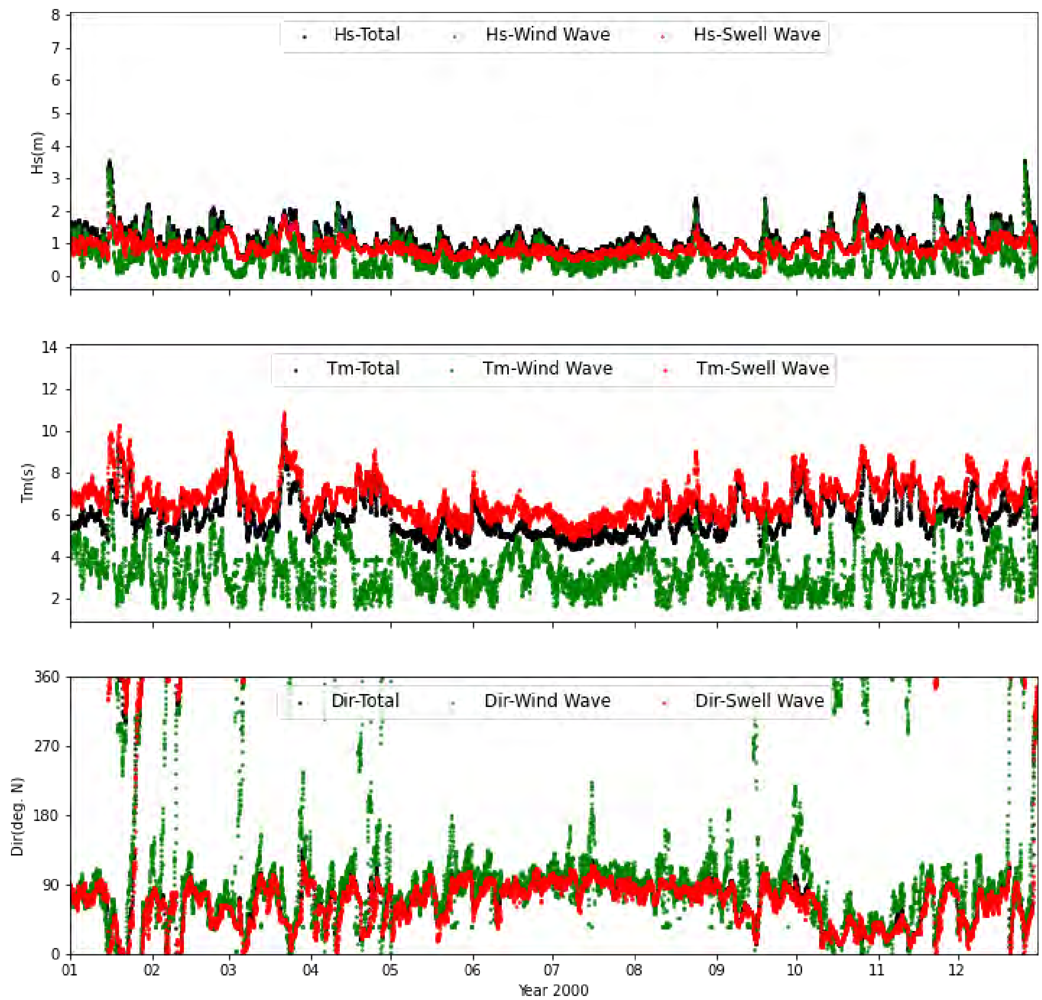


Figure A- 22 Wave Time Series – 2000

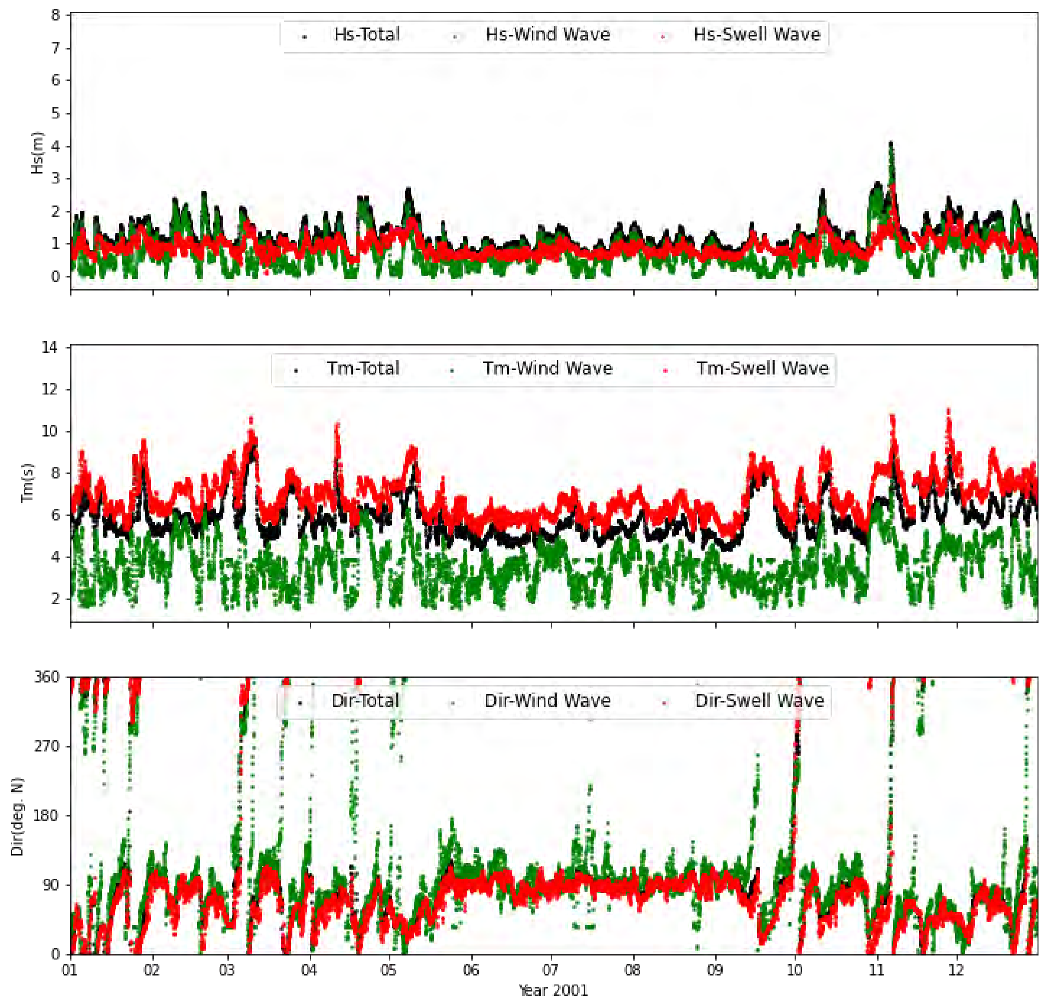


Figure A- 23 Wave Time Series – 2001

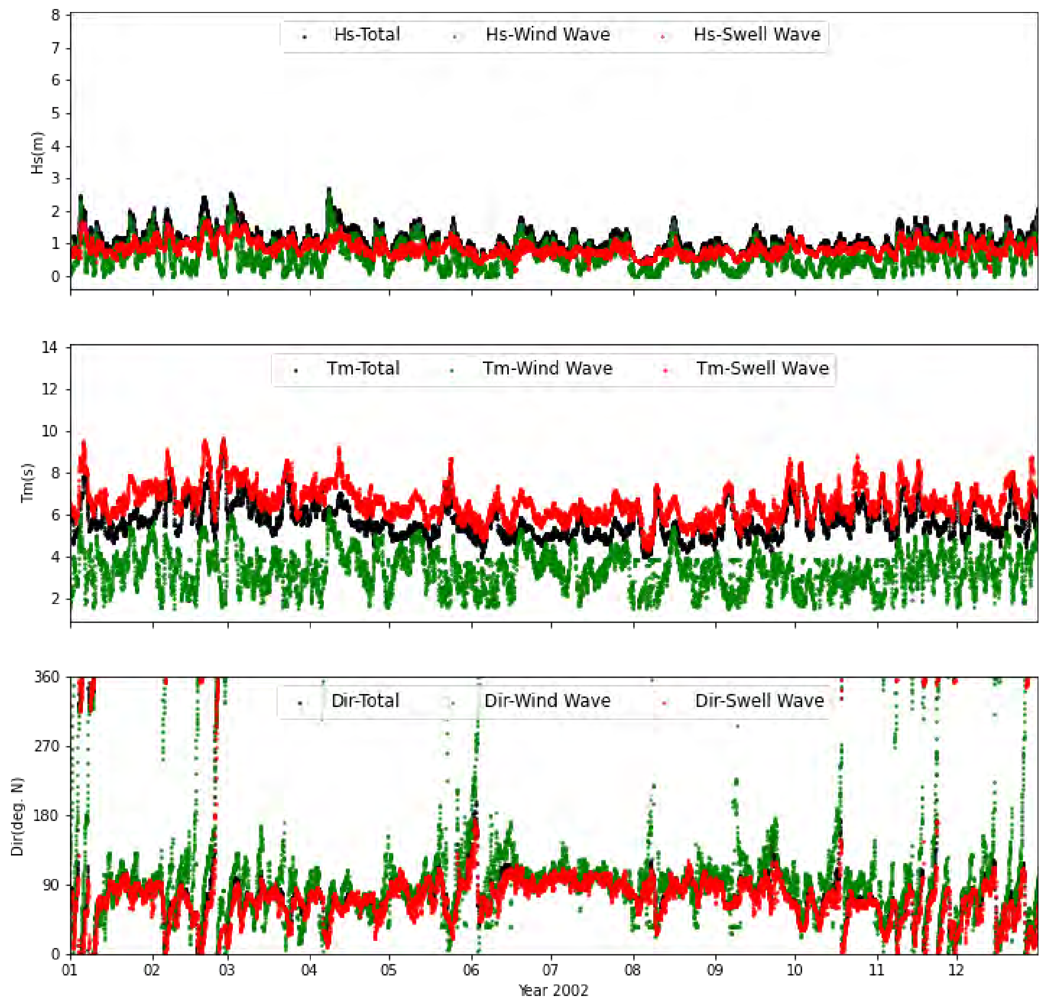


Figure A- 24 Wave Time Series – 2002

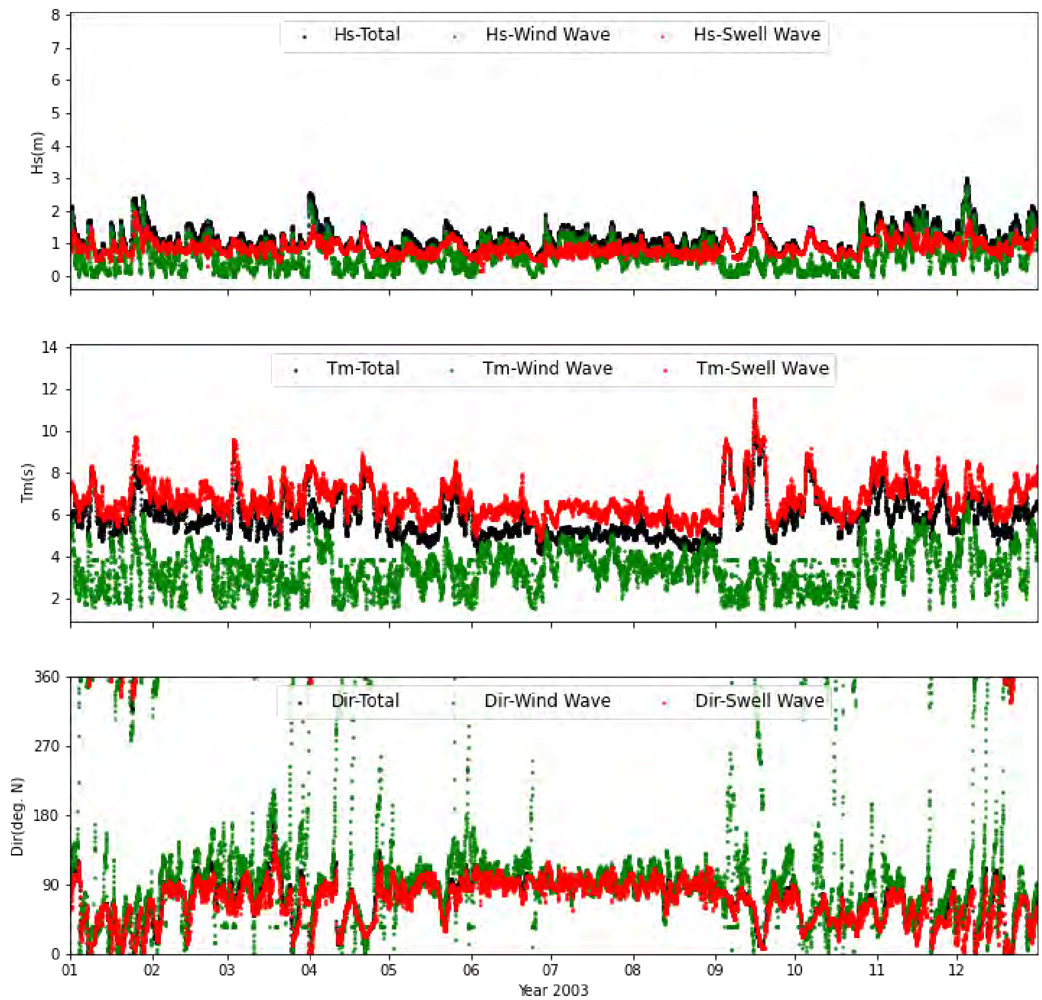


Figure A- 25 Wave Time Series – 2003

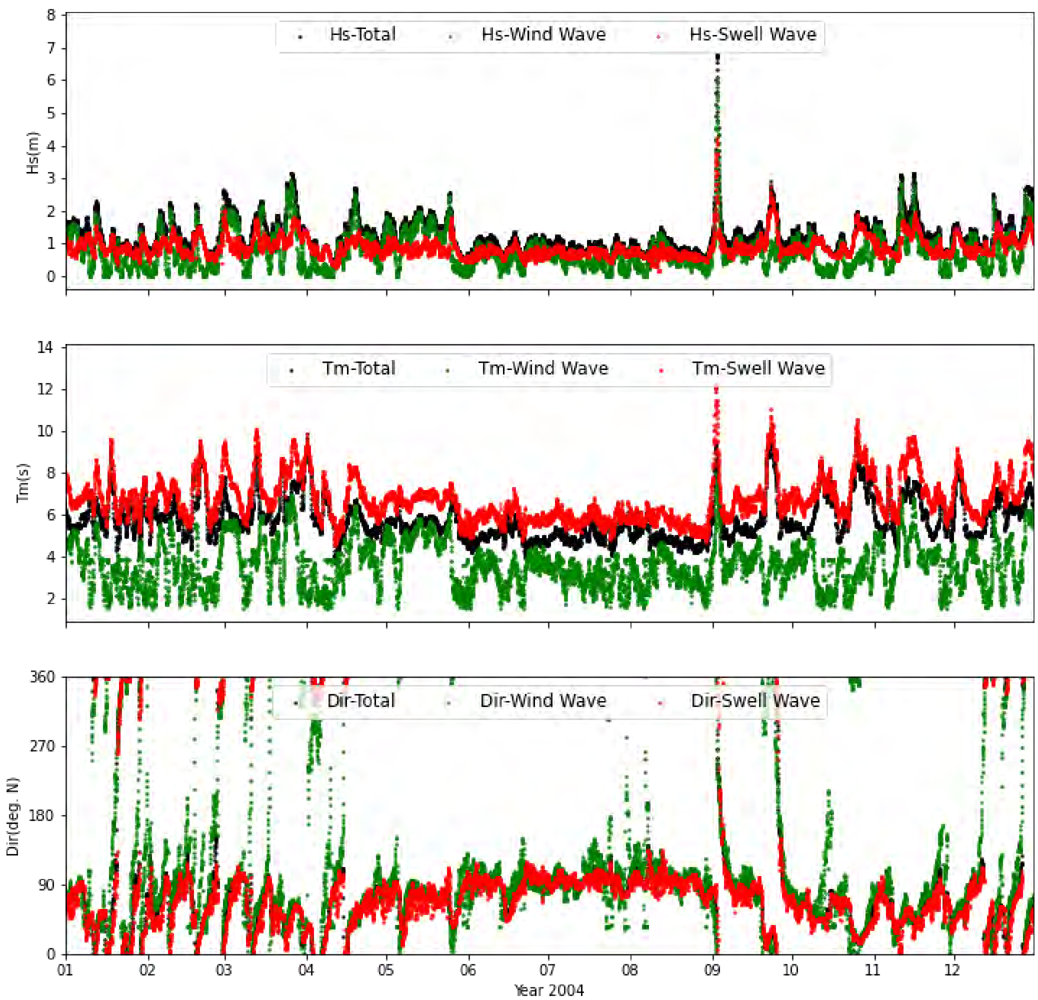


Figure A- 26 Wave Time Series – 2004

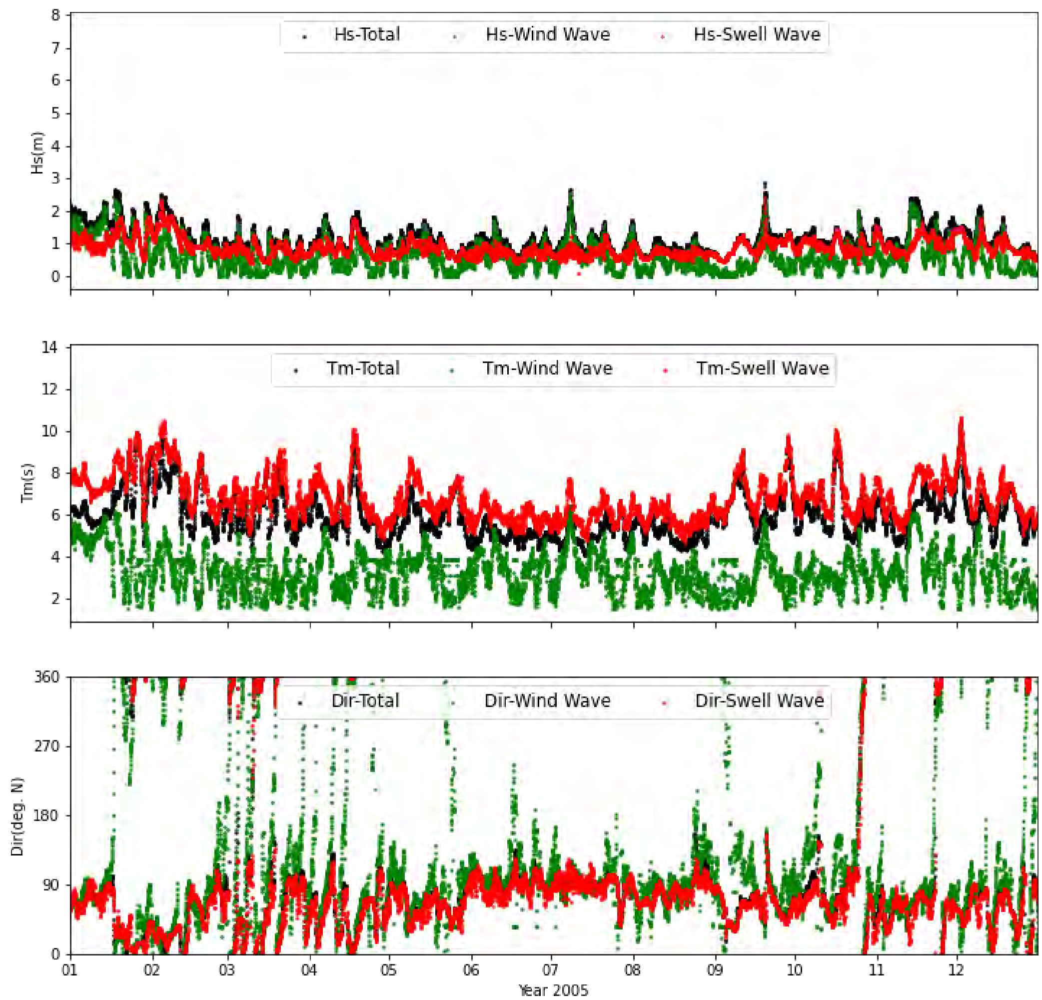


Figure A- 27 Wave Time Series – 2005

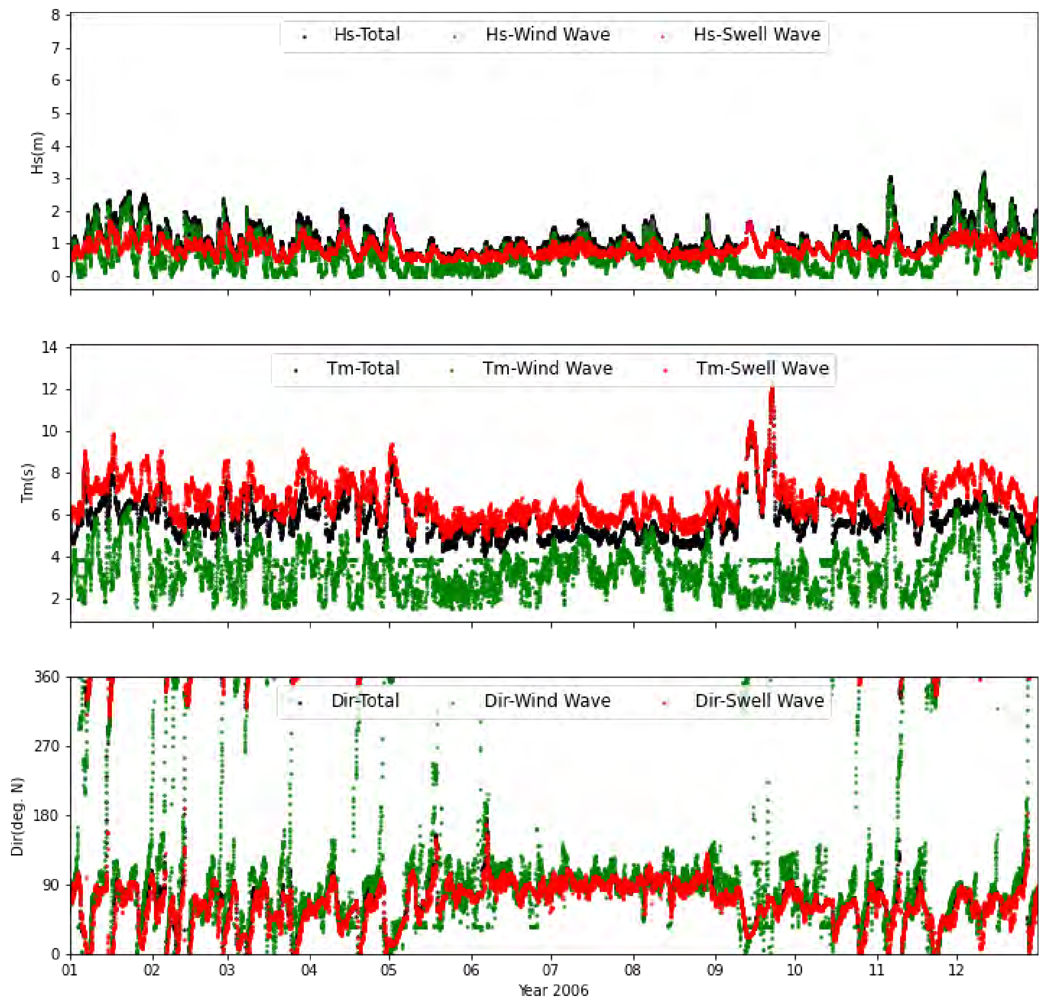


Figure A- 28 Wave Time Series – 2006

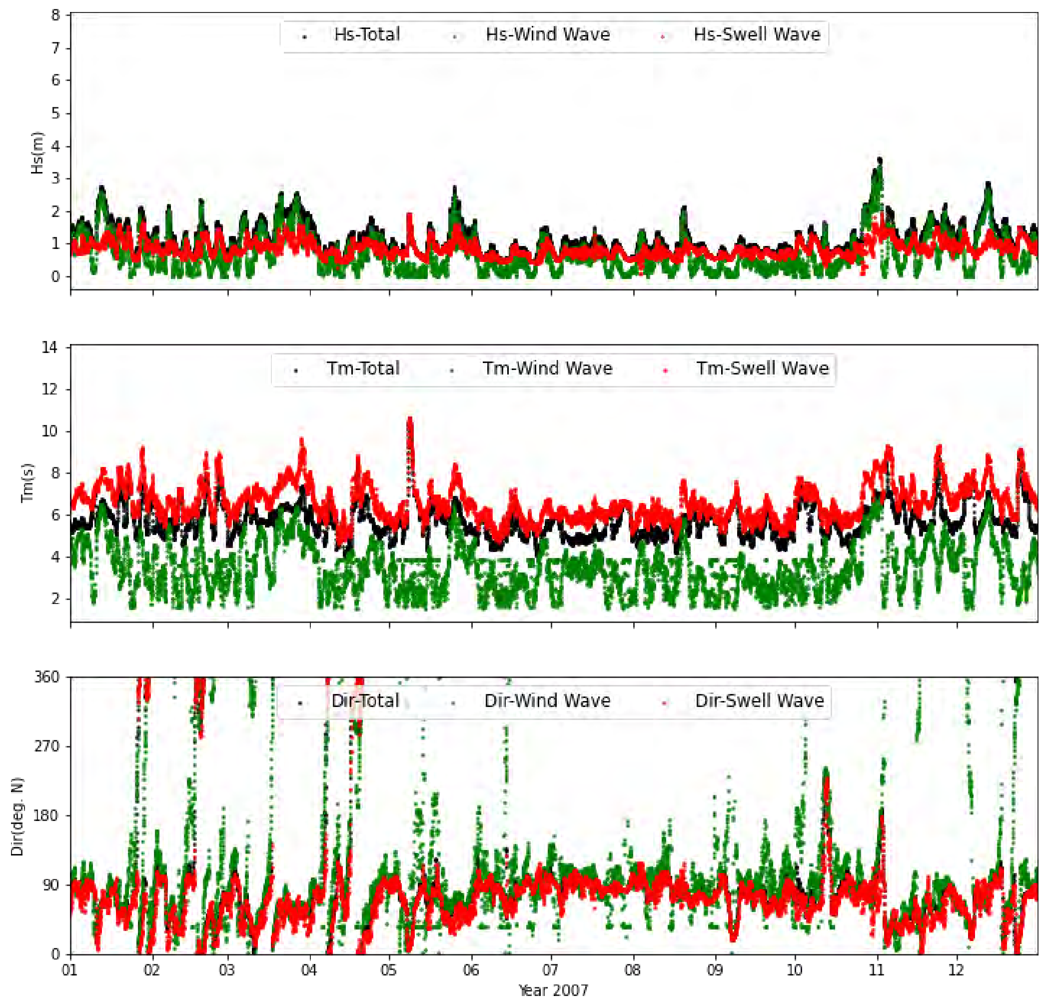


Figure A- 29 Wave Time Series – 2007

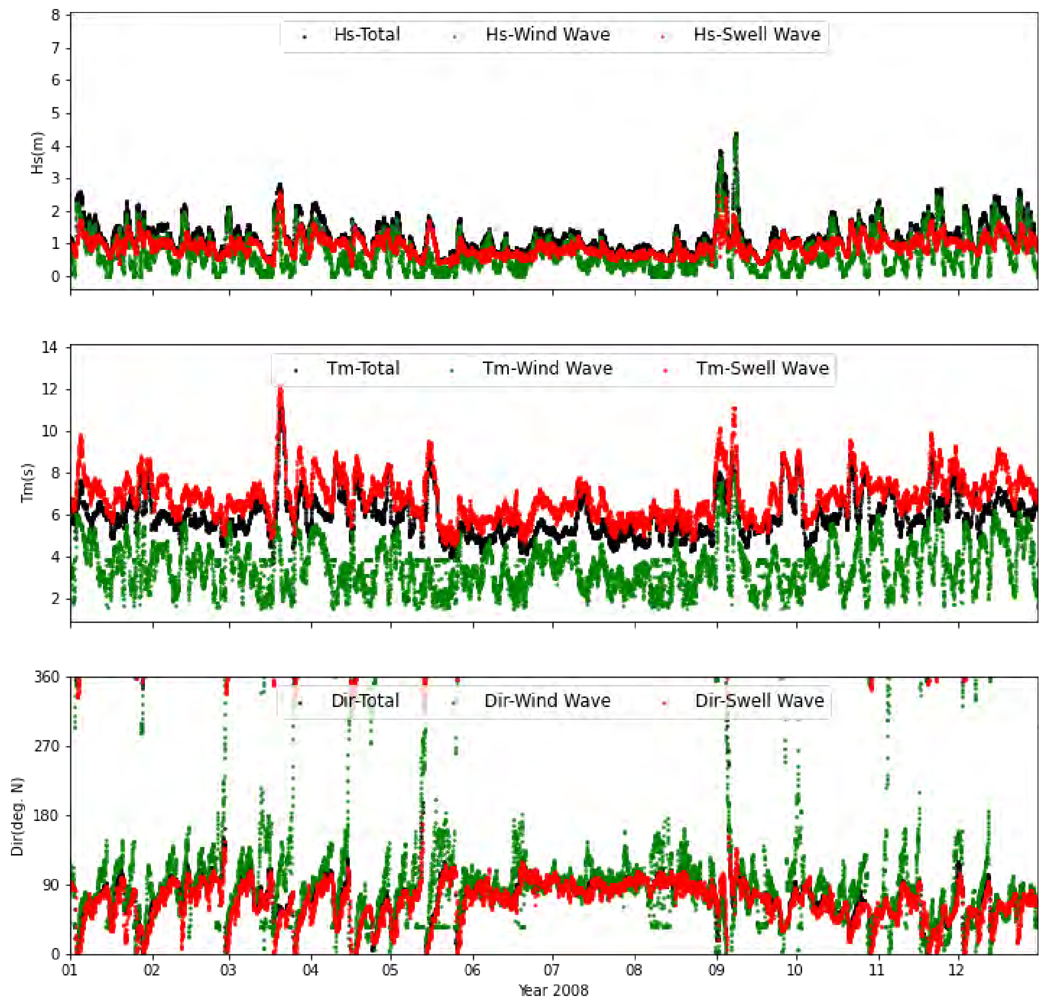


Figure A- 30 Wave Time Series – 2008

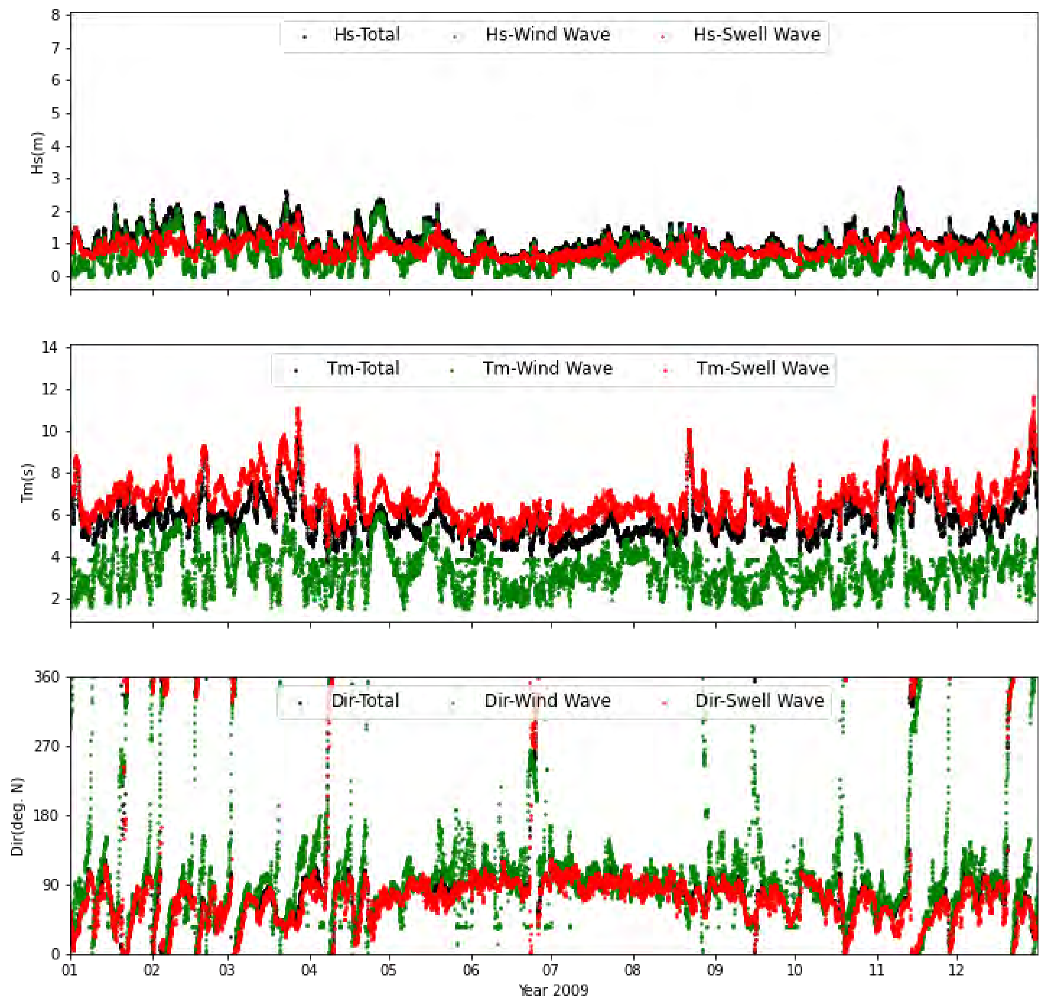


Figure A- 31 Wave Time Series – 2009

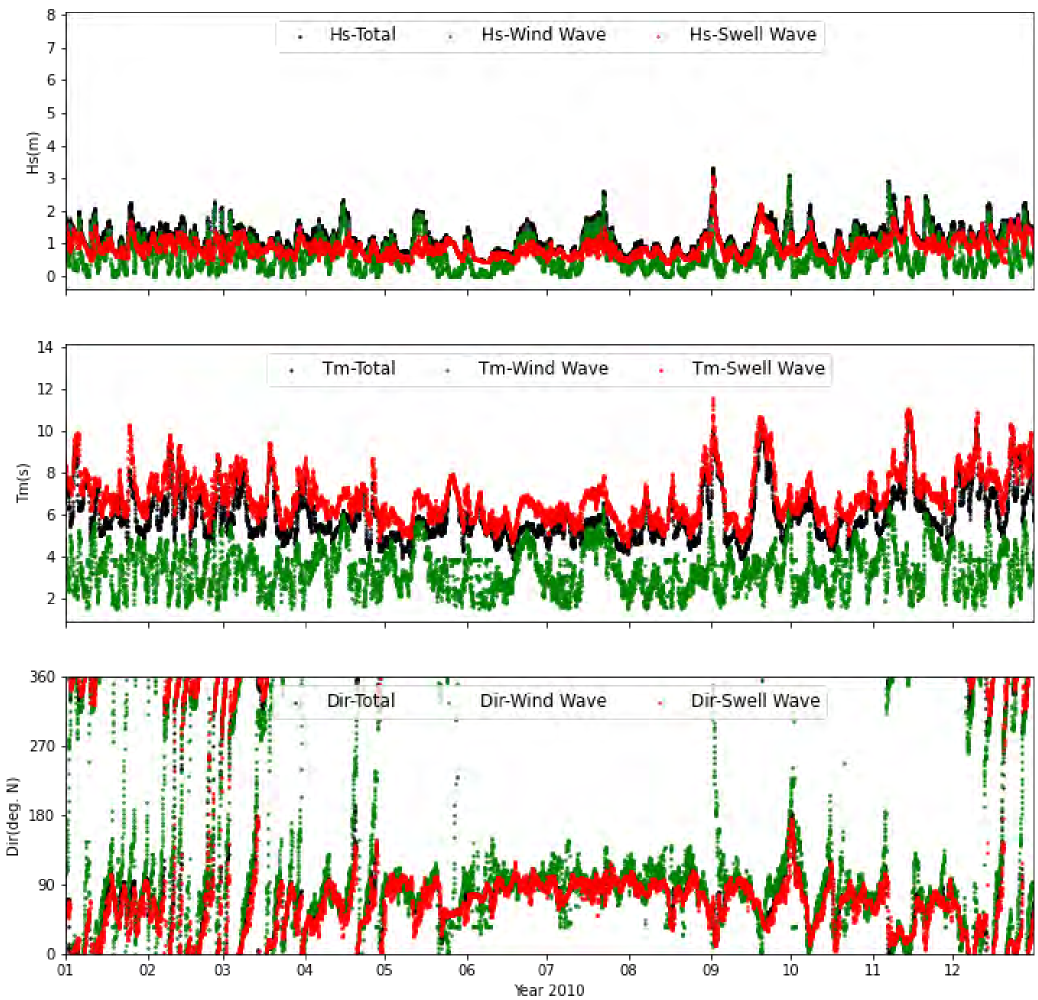


Figure A- 32 Wave Time Series – 2010

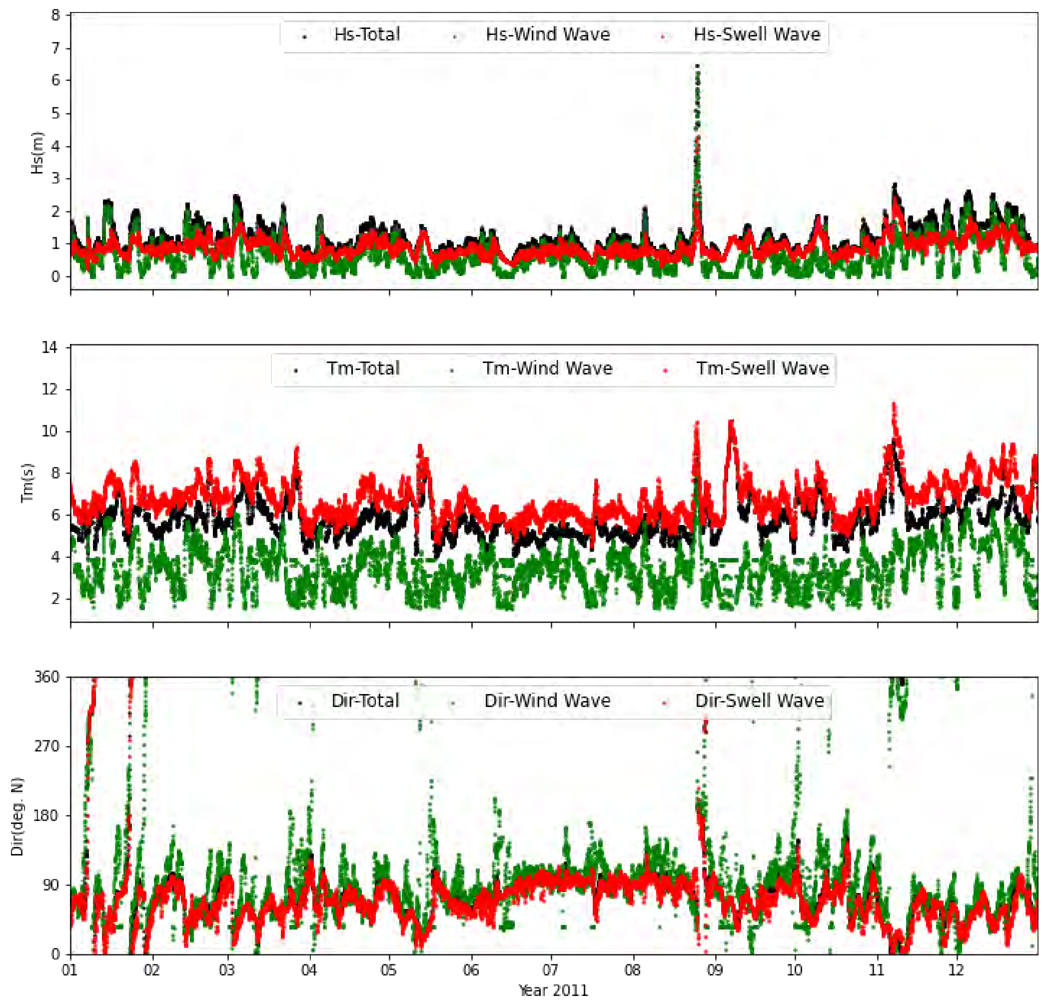


Figure A- 33 Wave Time Series – 2011

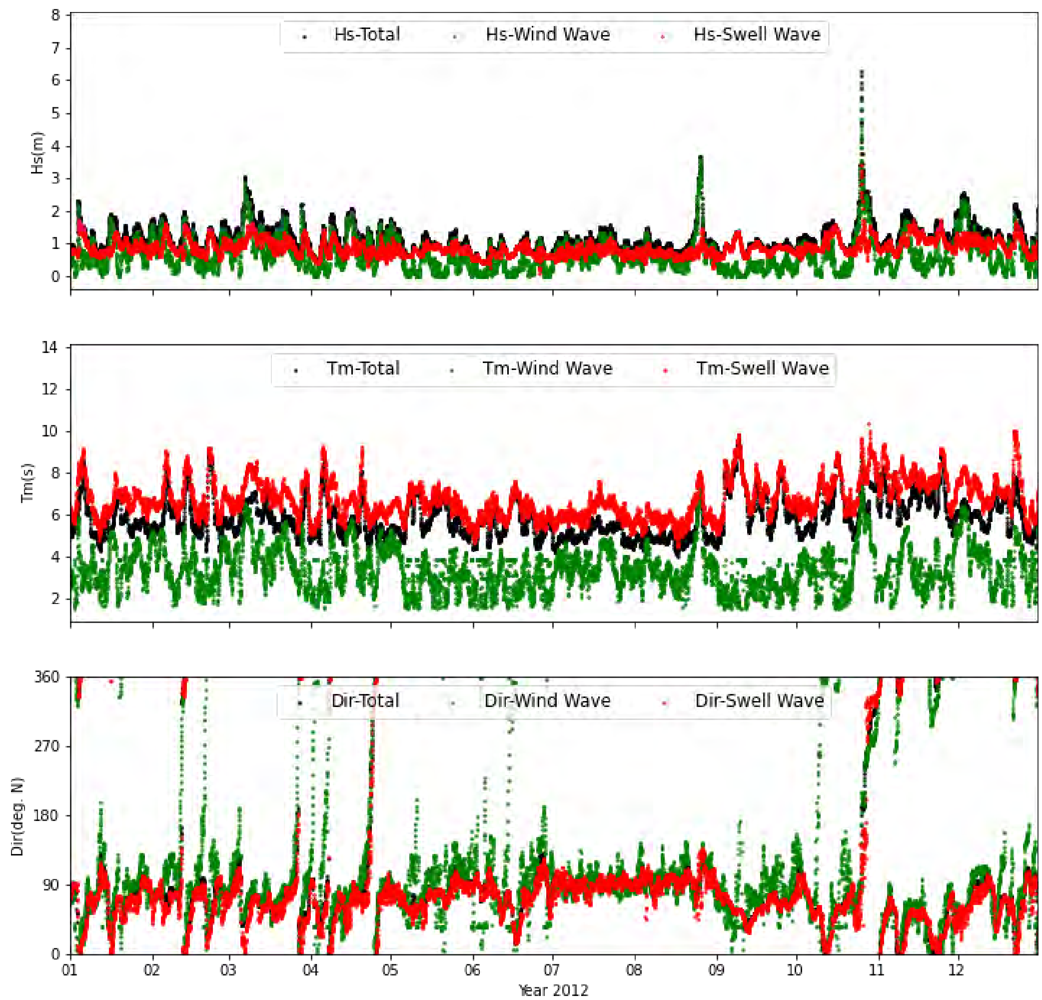


Figure A- 34 Wave Time Series – 2012

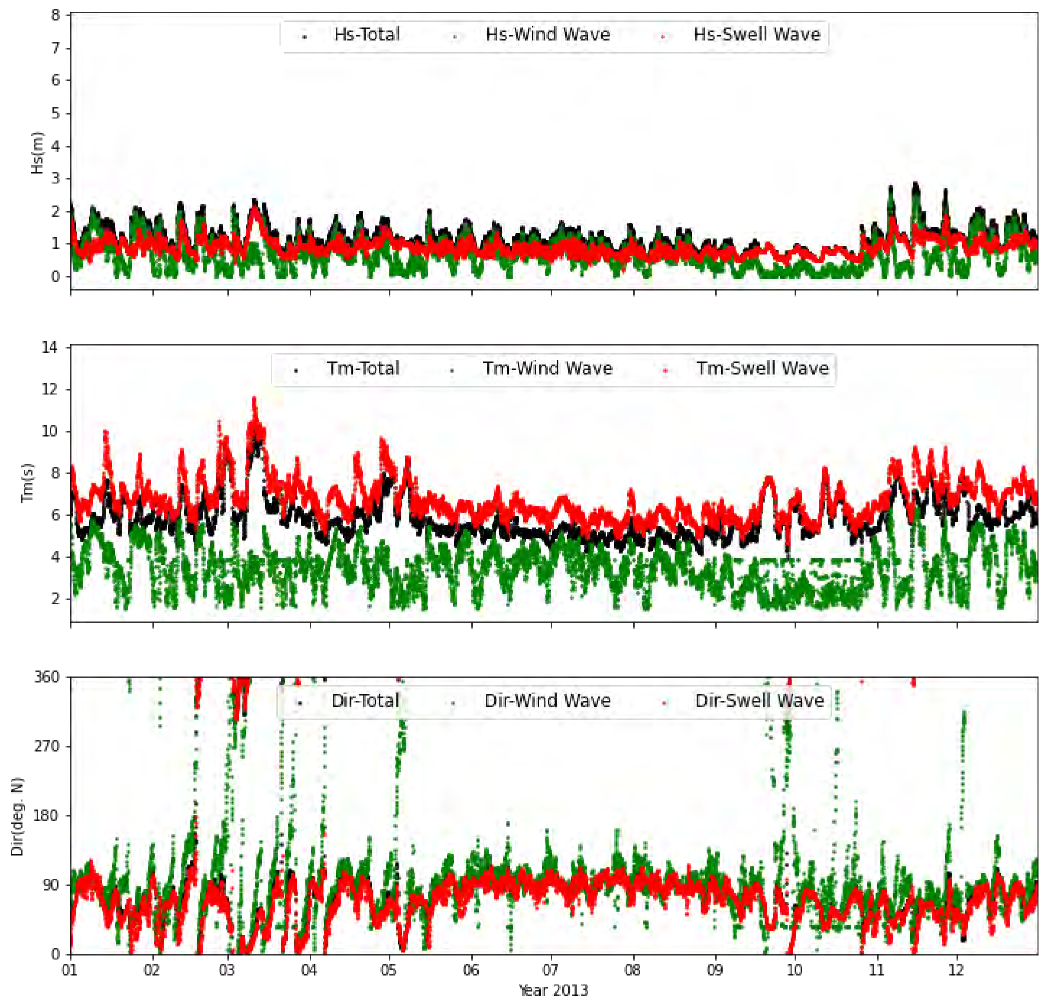


Figure A- 35 Wave Time Series – 2013

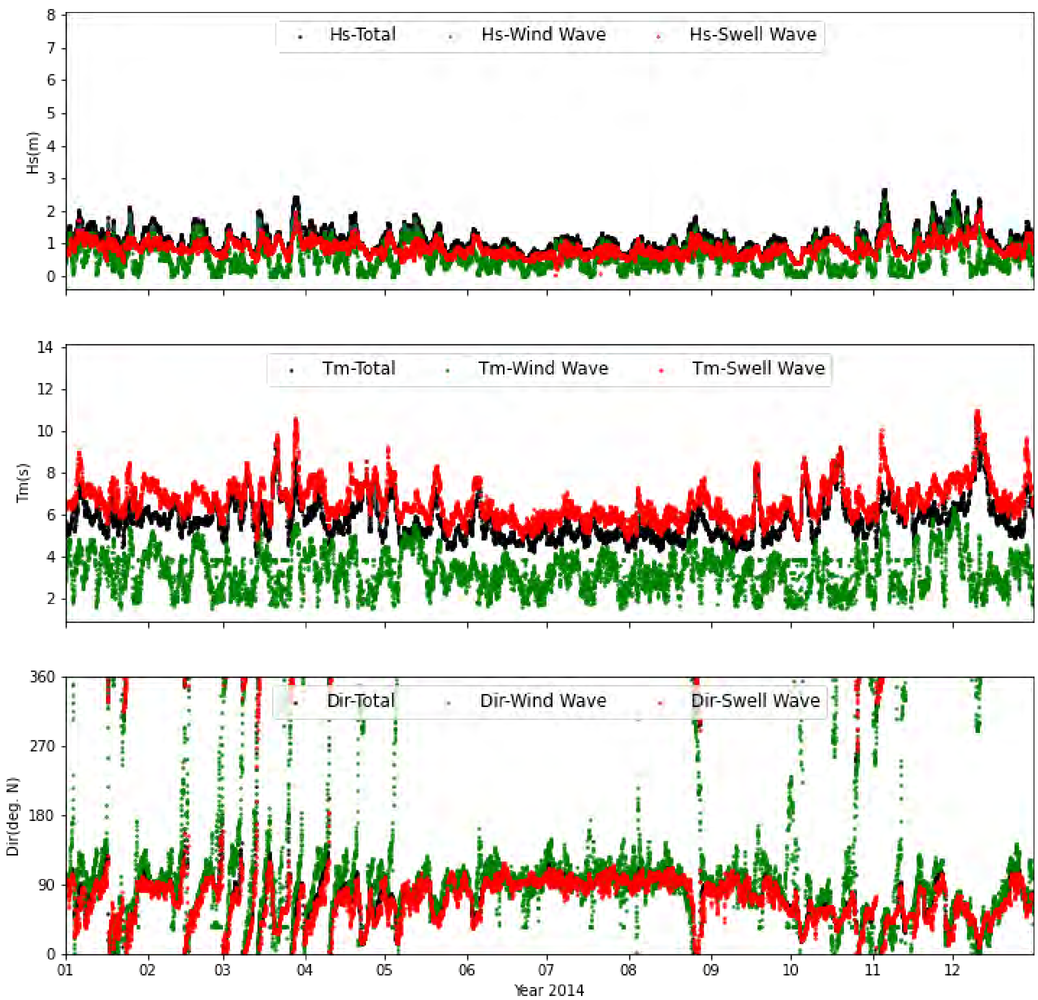


Figure A- 36 Wave Time Series – 2014

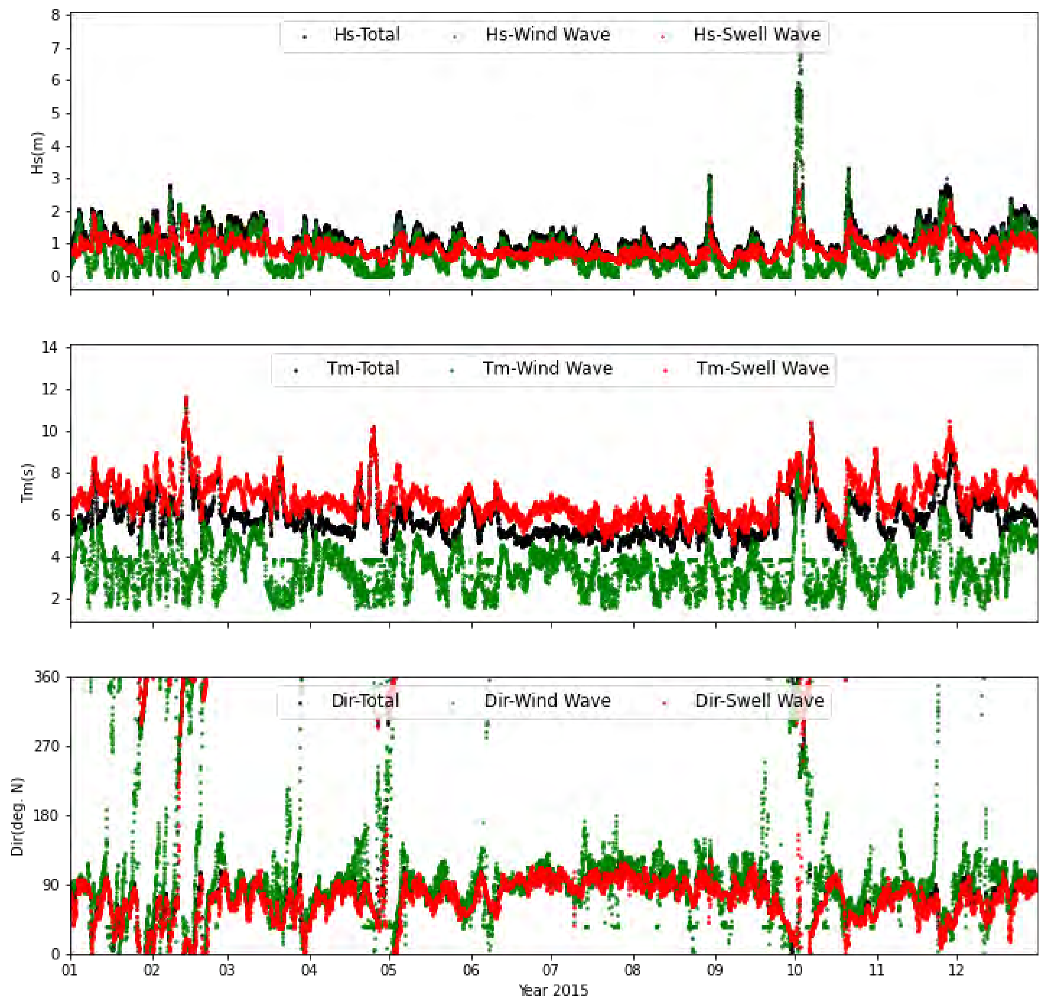


Figure A- 37 Wave Time Series – 2015

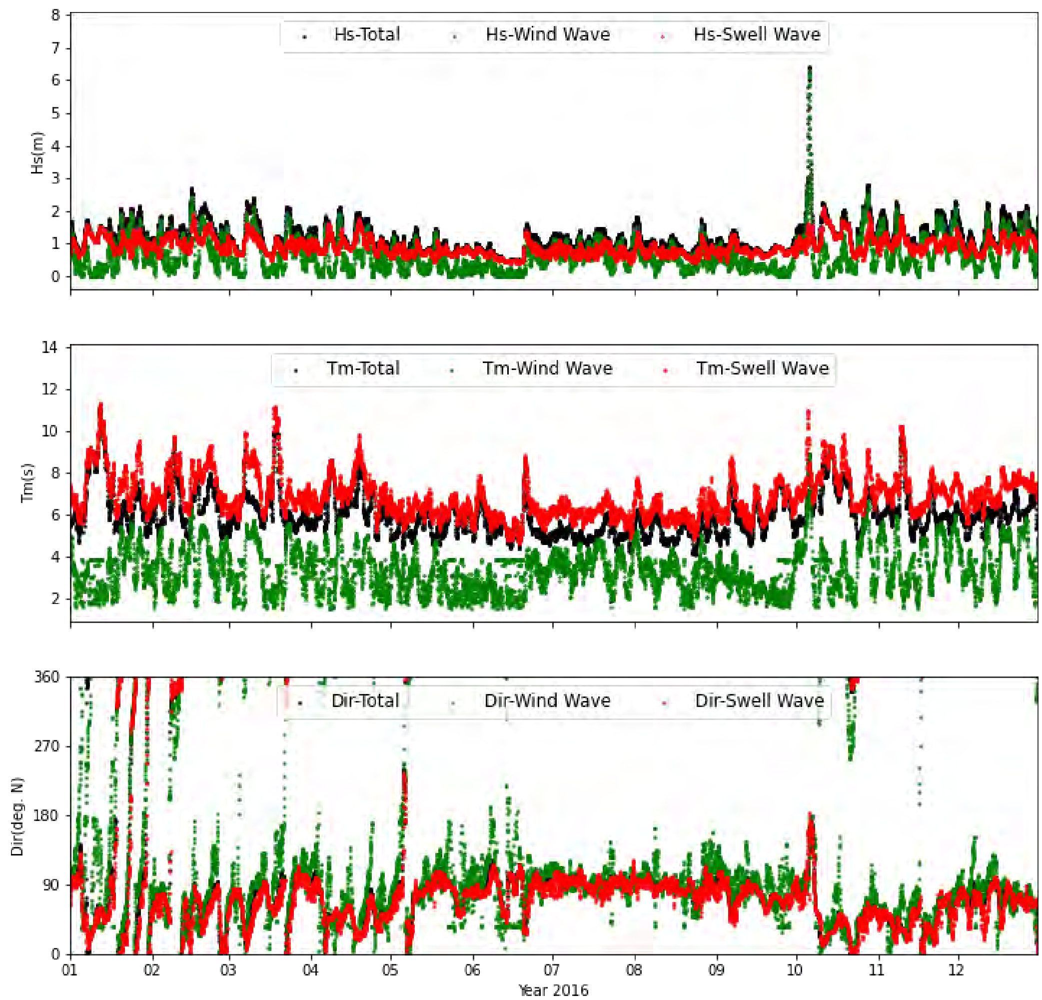


Figure A- 38 Wave Time Series – 2016

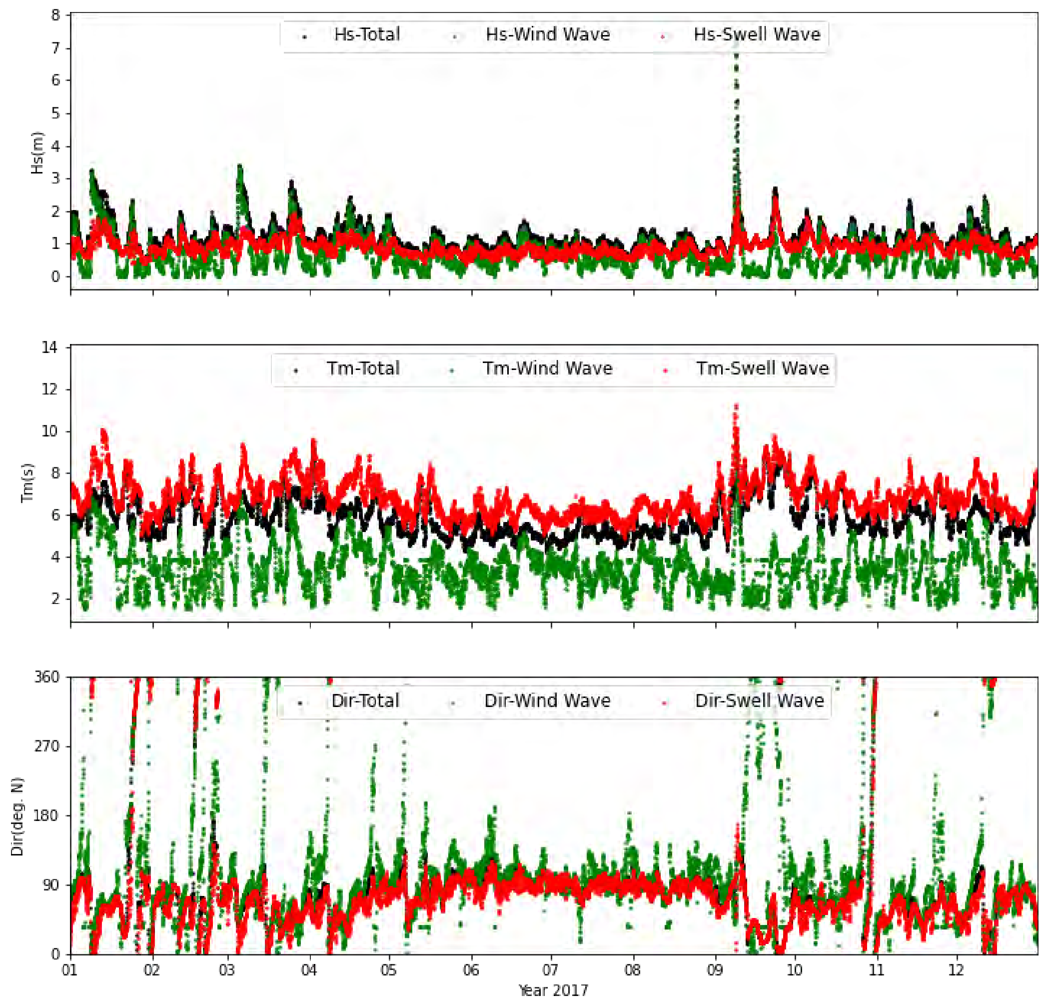


Figure A- 39 Wave Time Series – 2017

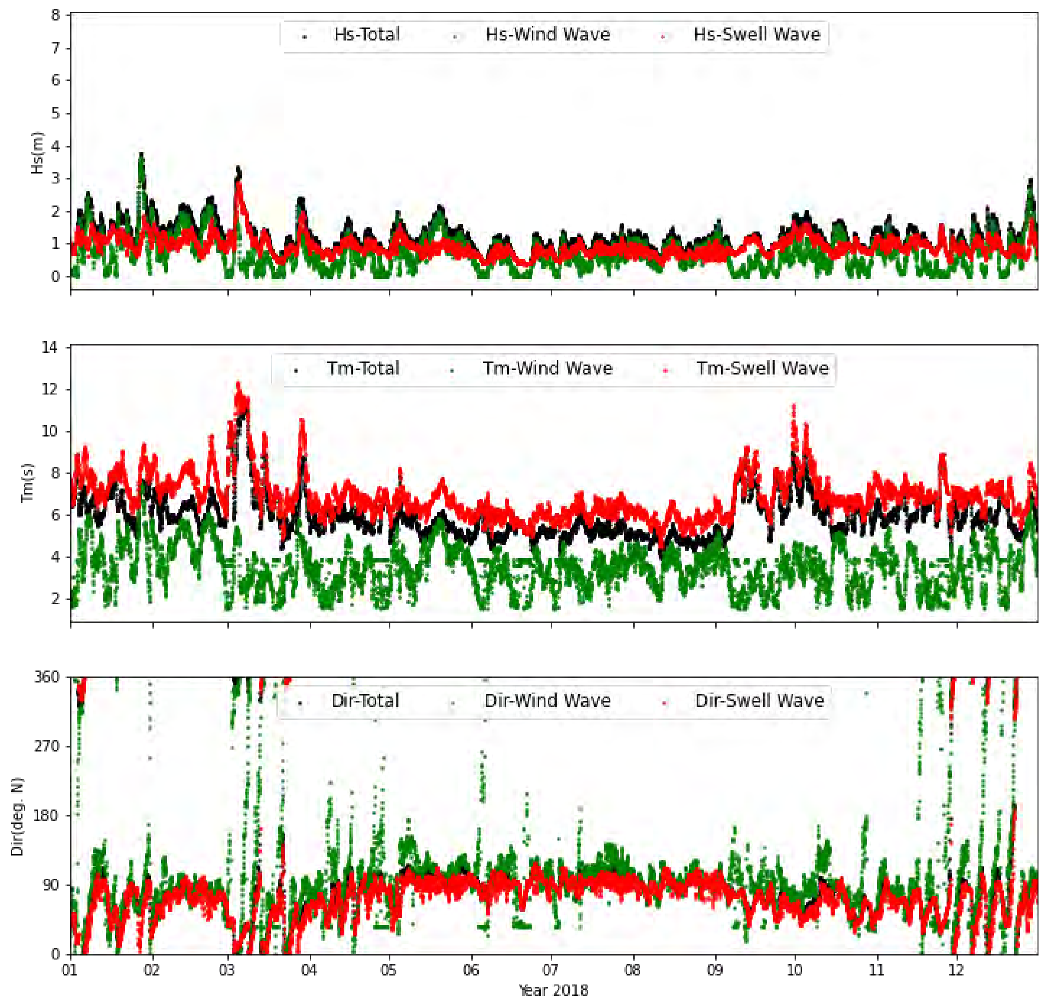


Figure A- 40 Wave Time Series – 2018

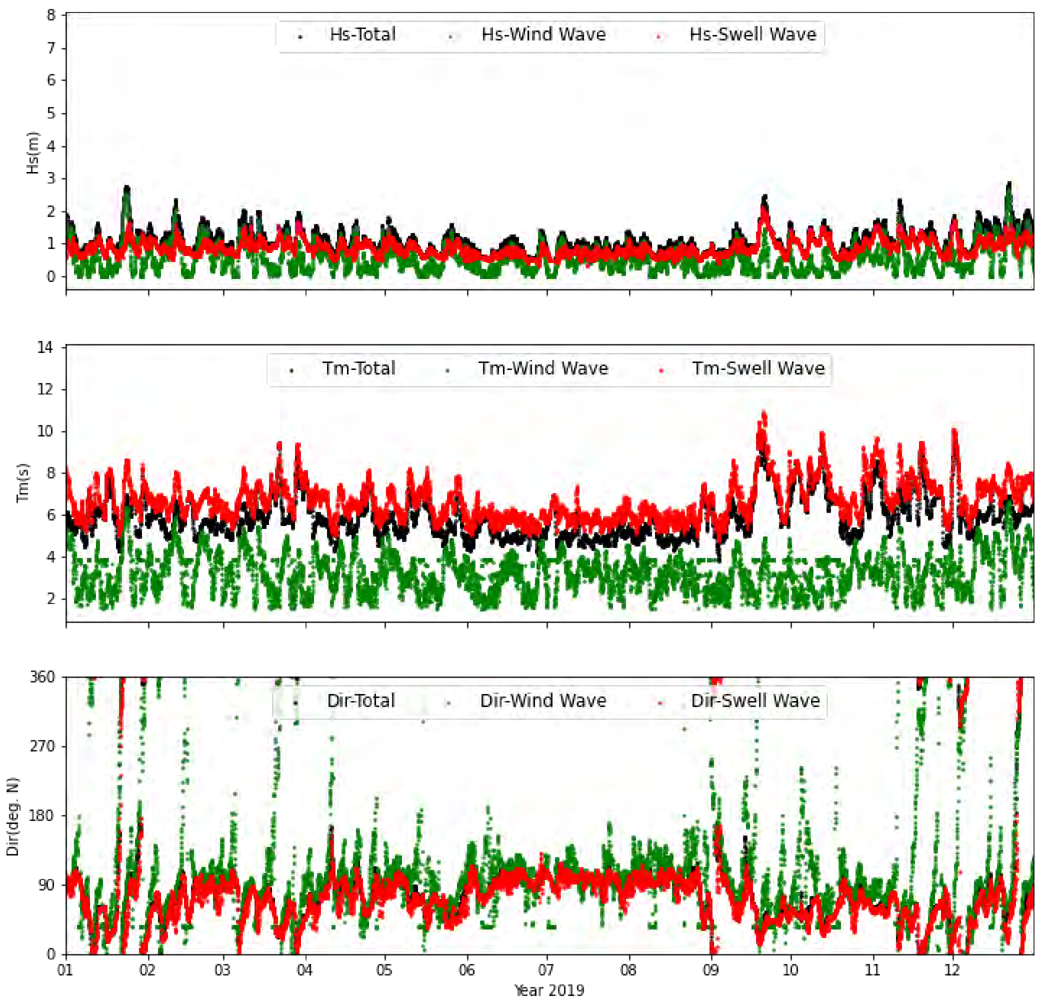


Figure A- 41 Wave Time Series – 2019

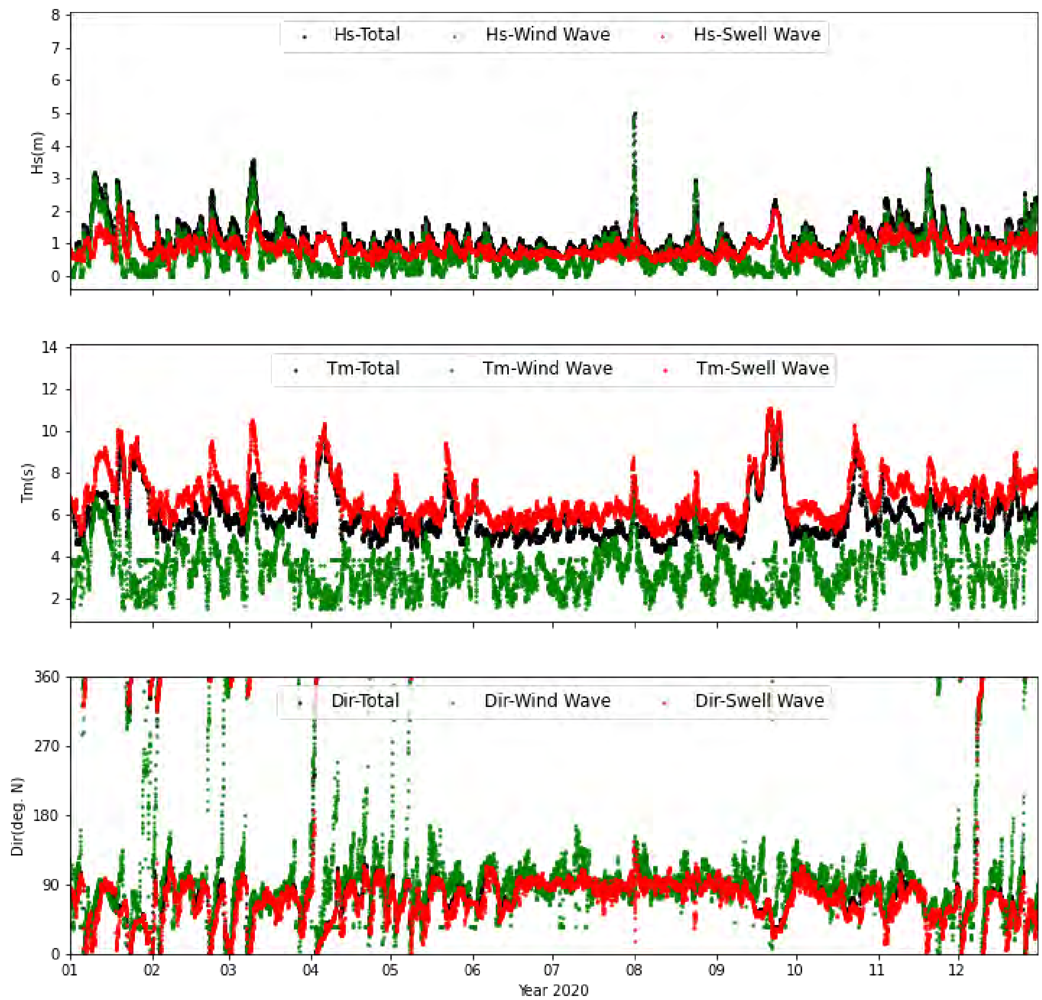


Figure A- 42 Wave Time Series – 2020

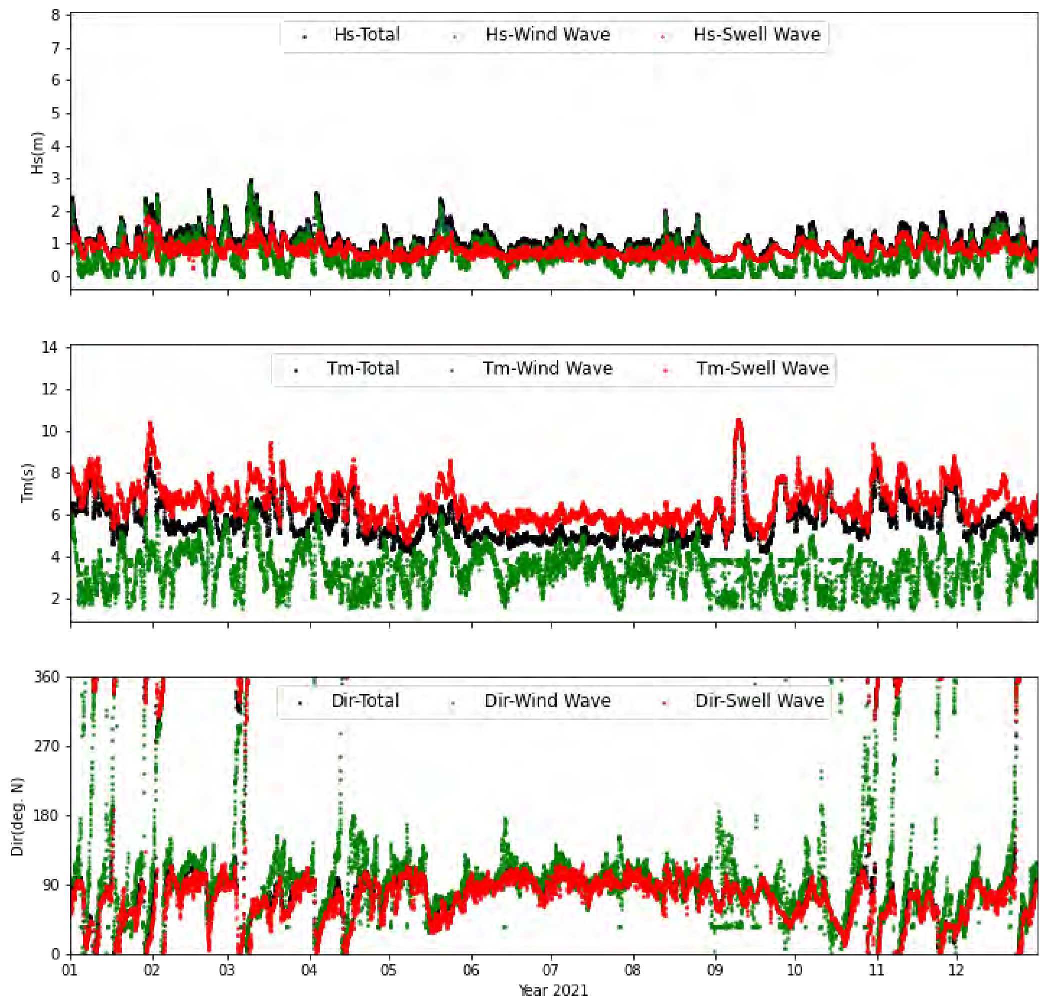


Figure A- 43 Wave Time Series – 2021

Appendix B

Marine Flora and Fauna Observed within the Assessment Area

Marine Species Observed during Assessments Conducted at and near the Site of the Proposed Calypso Cove Project, Long Island, Bahamas, during December 2022 and February 2023

Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments	CITES	IUCN	Within Project Area	Within Assessment Area
SHORELINE VEGETATION									
Avicennia germinans	Black Mangrove	Tree	Shorelines	Occasional	In forested wetl nr S Pt			p	p
Conocarpus erectus	Buttonwood	Tree	Shorelines	Abundant	In transition zone to land			p	p
Laguncularia racemosa	White Mangrove	Tree	Shorelines	Occasional	In forested wetl nr S Pt			p	p
Rhizophora mangle	Red Mangrove	Tree	Shorelines	Occasional	In forested wetl nr S Pt			p	p
MARINE PLANTS									
SEAGRASSES									
Halodule wrightii	Shoal-grass	Seagrass	Typically shallow bays	Common	Varying cover				p
Syringodium filiforme	Manatee-grass	Seagrass	Typically shallow bays	Occasional	Sparse to dense				p
Thalassia testudinum	Turtle grass	Seagrass	Typically shallow bays	Abundant	Sparse to dense			p	p
MACROALGAE									
Rhodophyta									
Acanthophora spicifera		Red Algae	Solid substrates	Occasional	On shell fragments				p
Amphiroa fragilissima	Amphiroa	Red Algae	Coral rubble, Grassbeds	Occasional	Occasionally dense				p
Amphiroa rigida	Amphiroa	Red Algae	Coral rubble, Grassbeds	Occasional	Occasionally dense				p
Amphiroa sp.	Amphiroa	Red Algae	Coral rubble, Grassbeds	Occasional					p
Ceramnium nitens		Red Algae	Attached to SAV	Occasional					p
Champia parvula	Champia	Red Algae	Attached to rubble	Occasional					p
Champia salicornioides	Champia	Red Algae	Attached to rubble	Occasional					p
Chondria capillaris		Red Algae	Attached to rubble	Common	On sandy bottoms				p
Galaxaura oblongata		Red Algae	On hard substrates	Occasional					p
Galaxaura subverticillata	Calcareous red algae	Red Algae	On hard substrates	Occasional					p
Halydictyon mirable		Red Algae	Attached to rubble	Occasional	On hardbottom in Sound				p
Hydrolithon boergesenii	Calcareous red algae	Red Algae	On hard substrates	Occasional					p
Hypnea cervicornis		Algae	Attached to rubble	Occasional	On hardbottom in Sound				p
Jania adhaerens		Red Algae	Attached to rubble	Occasional	On hard substrates				p
Laurencia papillosa		Red Algae	Red Algae	Occasional	On hardbottom in Sound				

Marine Species Observed during Assessments Conducted at and near the Site of the Proposed Calypso Cove Project, Long Island, Bahamas, during December 2022 and February 2023

Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments	CITES	IUCN	Within Project Area	Within Assessment Area
Laurencia intricata		Red Algae	Red Algae	Common	On hardbottom in Sound				p
Laurencia obtusa		Red Algae	Red Algae	Occasional	On hardbottom in Sound				p
Laurencia sp.	Laurencia	Red Algae	On hard substrates	Occasional	On hardbottom in Sound			p	p
Liagora sp.		Red Algae	On hard substrates	Occasional					p
Neogoniolithon spectabile		Red Algae	On hard substrates	Occasional	On hardbottom in Sound				p
Polysiphonia sp		Red Algae	On hard substrates	Occasional					p
Phaeophyta									
Dictyota cervicornis		Brown Algae	On hard substrates	Occasional					p
Dictyota guineensis		Brown Algae	On hard substrates	Occasional					p
Dictyota sp.		Brown Algae	On hard substrates	Common				p	p
Hincksia sp.		Brown Algae	On hard substrates	Occasional					p
Lobophora variegata	Fluffy Ruffles	Brown Algae	On hard substrates	Occasional	mostly east side				p
Padina haitiensis	Scroll Algae	Brown Algae	On hard substrates	Occasional					p
Padina sanctae-crucis	Scroll Algae	Brown Algae	On hard substrates	Abundant					p
Sargassum hystrix	Sargassum Weed	Seaweed	Drift, sometimes rooted	Occasional					p
Sargassum platycarpum	Sargassum Weed	Seaweed	Drift, sometimes rooted	Occasional					p
Sargassum sp.	Sargassum Weed	Seaweed	Drift, sometimes rooted	Common				p	p
Stypopodium zonale	Brown Algae	Seaweed	Solid substrates	Occasional					p
Turbinaria tricostata	Saucer Leaf Alga	Brown Algae	Solid substrates	Occasional					p
Turbinaria turbinata	Blistered Saucer Leaf alga	Brown Algae	Solid substrates	Occasional					p
Chlorophyta									
Acetabularia calyculus	Mermaid's Wine Glass	Green Algae	Sandy areas nr reefs	Common					p
Avrainvillea longicaulis									p
Avrainvillea nigricans		Green Algae	Sandy bottoms	Occasional					p
Avrainvillea silvana		Green Algae	Sandy bottoms	Occasional					p
Avrainvillea sp.		Green Algae	Sandy bottoms	Occasional					p
Batophora oerstedii	Batophora	Green Algae	Attached to solid substrate	Abundant	mostly nr MHW			p	p

Marine Species Observed during Assessments Conducted at and near the Site of the Proposed Calypso Cove Project, Long Island, Bahamas, during December 2022 and February 2023

Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments	CITES	IUCN	Within Project Area	Within Assessment Area
Caulerpa cupressiodes	Cactus tree algae	Green Algae	Sandy areas, betw reefs	Occasional					p
Caulerpa lanuginosa		Green Algae	in SAV beds	Occasional					p
Cladophora sp.		Green Algae	Solid substrates	Common	component of turf algae				p
Cymopolia barbata		Green Algae	Attached to solid substrate	Occasional	near RORO				p
Dictyosphaeria cavernosa	Algae	Green Algae	Attached to solid substrate	Occasional				p	p
Halimeda incrassata	Three-finger Leaf Algae	Green Algae	Grassbeds and reefs	Common	Interspersed w/ seagrass			p	p
Halimeda monile	Algae	Green Algae	Sand flats, seagrasses	Common					p
Halimeda opuntia	Watercress Algae	Green Algae	Attached to rocks	Common					p
Microdictyon marinum	Network Algae	Green Algae	Attached to reefs	Abundant					p
Microdictyon sp.	Network Algae	Green Algae	Attached to reefs	Common					
Neomeris annulata		Green Algae	Solid substrates	Occasional					p
Penicillus capitatus	Bristle Ball Brush	Green Algae	Mud and sand bottoms	Common	Interspersed w/ seagrass				p
Penicillus dumetosus	Bristle Ball Brush	Green Algae	Grassbeds, sandy bottoms	Common	Interspersed w/ seagrass				p
Penicillus pyriformis	Flat-top Bristle Brush	Green Algae	Sandy areas, betw reefs	Common	Interspersed w/ seagrass				p
Rhipocephalus phoenix	Pine cone Algae	Green Algae	Sandy bottoms	Common	Interspersed w/ seagrass				p
Udotea flabellum		Green Algae	Sandy bottoms	Common					p
Udotea luna		Green Algae	Sandy areas, betw reefs	Common					p
Ventricaria ventricosa		Green Algae	Reefs, hardbottom	Occasional					p
Chrysophyta									
Chrysocystis lewisii	Golden Algae	Golden Algae	Hardbottom	Occasional					p
SPONGES									
Agelas conifera	Brown Tube Sponge	Sponge	Coral reefs, grassbed	Common		-			p
Agelas wiedenmyeri	Brown clustered Tube Spong	Sponge	Coral reefs, grassbed	Occasional				p	p
Aiolochroia crassa	Branching Tube Sponge	Sponge	Coral reefs	Occasional					p
Aplysina archeri	Stovepipe Sponge	Sponge	Reefs & walls	Occasional					p
Aplysina cauliformes	Row Pore Rope Sponge	Sponge	Steep slopes & walls	Occasional					p
Aplysina fistularis	Yellow Tube Sponge	Sponge	Coral reefs	Occasional					p

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Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments	CITES	IUCN	Within Project Area	Within Assessment Area
Aplysina insularis	Branchlet Sponge	Sponge	Coral reefs	Occasional					p
Aplysina sp.	Rope Sponge	Sponge	Coral reefs	Occasional					p
Aplysina lacunosa	Yellow Sponge	Sponge	Coral reefs	Occasional					p
Aplysina tubulata	Tubulate Sponge	Sponge	Coral reefs	Occasional					p
Artemisina melana	Dark Encrusting Sponge	Sponge	Coral reefs	Occasional					p
Callyspongia plicifera	Azure vase sponge	Sponge	Coral reefs	Occasional					p
Callyspongia vaginalis	Branching vase sponge	Sponge	Coral reefs	Occasional					p
Chrondrilla caribensis	Mustard Boring sponge	Sponge	Hardbottoms	Occasional					p
Cliona delitrix	Red Boring Sponge	Sponge	Coral Reefs	Occasional					p
Cliona varians	Brown Variable Sponge	Sponge	Coral Reefs	Occasional					p
Cribrochalina vasculum	Brown Bowl Sponge	Sponge	Reefs, walls, rubble	Occasional					p
Demospongiae	Mustard Sponge	Sponge	Grassbeds	Common					p
Demospongiae	Brown Encrusting Sponge	Sponge	Hardbottom, reefs	Common					p
Geodia neptuni	Leathery Barrel Sponge	Sponge	Coral reefs	Occasional					p
Ircinia strobilina	Black-ball Sponge	Sponge	Coral Reefs	Common				p	p
Ircinia felix	Stinker Sponge	Sponge	Coral Reefs	Occasional				p	p
Demospongiae	Rope Sponge	Sponge	Seagrass beds	Common					p
Niphates erecta	Lavender Rope Sponge	Sponge	Coral Reefs	Occasional				p	p
Siphonodictyon coralliphagum	Variable Boring Sponge	Sponge	Reefs	Occasional					p
Svenzea zedi	Dark Volcano Sponge	Sponge	Hardbottom, SAV, reefs	Occasional					p
Verongula gigantea	Netted Barrel Sponge	Sponge	Reefs	Occasional				p	p
Verongula reiswigi	Green Netted Barrel Sponge	Sponge	Reefs	Occasional					p
Xestospongia muta	Barrel Sponge	Sponge	Coral Reefs	Common				p	p
CRUSTACEANS									
Ancylomenes pedersoni	Pederson's Cleaner Shrimp	Shrimp	Reefs, esp w anemones	Occasional					p
Ocypode albicans	Ghost Crab	Crab	Beaches	Occasional					p

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Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments	CITES	IUCN	Within Project Area	Within Assessment Area
Panulirus argus	Spiny Lobster	Lobster	Reef recesses	Occasional					p
Periclimenes pedersoni	Pederson Cleaner Shrimp	Shrimp	Reefs, esp w anemones	Occasional					p
Squillidae	Mantis Shrimp	Shrimp	Sandy substrates	Occasional	Only saw burrows				p
MOLLUSKS									
Acanthopleura granulata	Fuzzy Chiton	Chiton	Intertidal rocks	Occasional					p
Batillaria minima	Black Horn Snail	Snail	Intertidal rocks	Common				p	p
Bayericerithium litteratum	Lettered Cerith	Snail	Hardbottom	Common				p	p
Bulla occidentalis	West Indian Bubble	Snail	Sandy areas, grassbeds	Occasional	mostly on shore				p
Cerithium litteratum	Stocky Cerith	Snail	Seagrass beds	Common	Occasional in lg groups			p	p
Cittarium pica	West Indian Top Shell	Snail	Rocky shorelines	Occasional					p
Columbella mercatoria	Common Dove Snail	Snail	Hardbottom	Uncommon					p
Conus sp.	Cone	Snail	Sandy bottoms, SAV	Uncommon					p
Cyphoma gibbosum	Flamingo Tongue	Snail	Reefs, esp sea fans	Occasional					p
Dentalium sp.	Tuskshell	Snail	Shallow areas, bays	Occasional					p
Diadora sp.	Limpet	Snail	Rocky shorelines	Uncommon					p
Fasciolaria tulipa	Tulip	Snail	Shallow areas, bays	Occasional					p
Lobatus (fka Strombus) costatus	Milk Conch	Conch	Grassbeds, sand flats	Occasional					p
Macrocypraea zebra	Measled Cowrie	Snail	Shallow reefs & rocks	Occasional					p
Nerita peloronta	Bleeding Tooth	Snail	Intertidal rocks	Occasional				p	p
Phalium granulatum	Scotch Bonnet	Snail	Sand Flats	Occasional					p
Pinna carnea	Sea pen	Clam	Sandy bottoms, grassbeds	Occasional					p
Polinices lacteus	Milk Moonsnail	Snail	Sandy bottoms	Occasional	Only saw egg cases				p
Sepioteuthis sepioidea	Caribbean Reef Squid	Squid	Over reefs	Occasional					p
Lobatus (fka Strombus) costatus	Milk Conch	Conch	Grassbeds, sand flats	Occasional	Mostly juveniles				p
Strombus gigas	Queen Conch	Conch	Grassbeds, sand flats	Occasional	Mostly juveniles				p
Tectarius muricatus	Beaded Periwinkle	Snail	Shoreline Coastal Rock	Common	On rocks near water line			p	p

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Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments	CITES	IUCN	Within Project Area	Within Assessment Area
Tellina radiata	Sunrise Tellin	Clam	Sand flats	Occasional					p
Thais sp.	Rock Shell	Snail	Grassbeds	Occasional					p
Turbinella angulata	West Indian Chank Shell	Snail	Sandy bottoms	Occasional					p
ECHINODERMS									
Clypeaster rosaceus	West Indian Sea Biscuit	Sea urchin	Seagrasses, Coral rubble	Occasional	Only saw empty tests				p
Clypeaster subdepressus	Flattened Sea Biscuit	Sand dollar	Seagrasses, Coral rubble	Occasional	Only saw empty tests				p
Diadema antillarum	Long-spined Urchin	Sea urchin	Reefs	Common					p
Echinometra viridis	Reef Urchin	Sea urchin	Reefs, coral rubble	Occasional					p
Ascidiacea	Tunicate	Tunicate	Solid substrate in SAV	Occasional					p
Leodia (Mellita) sexiesperforata	Six-Keyhole Sand Dollar	Sand dollar	Sandy areas	Occasional	Saw mostly dead skeletons				p
Meoma ventricosa	Red Heart Urchin	Sea Urchin	Reefs, sandy areas	Occasional					p
Oreaster reticulatus	Cushion Sea Star	Starfish	Grassbeds, sand flats	Uncommon	Only saw one				p
Plagiobrissus grandis	Long-spined Sea Biscuit	Sea urchin	Hardbottom, grassbeds	Occasional					p
Tripneustes ventricosus	West Indian Sea Egg Urchin	Sea urchin	Seagrass beds, reefs	Occasional					p
ANNELIDS									
Anamobaea oerstedi	Split-crown feather-duster	Worm	Reefs	Occasional					p
Bispira brunnea	Social Feather Duster	Worm	Reefs	Common				p	p
Notaulax occidentalis	Yellow Fan-worm	Worm	Reefs	Occasional					p
Spirobranchus giganteus	Christmas-tree Worm	Worm	Coral reefs	Occasional				p	p
Pomatostegus stellatus	Star Horseshoe Worm	Worm	Reefs	Occasional					p
CNIDARIANS									
Bartholmea annulata	Corkscrew anemone	Anemone	Reefs, rubble	Occasional					p
Condylactis gigantea	Pink-tipped (Giant) Anemone	Anemone	Reefs & Lagoons	Uncommon					p
Hydroida	Hydroid	Hydroid	Reefs	Occasional					p
Sertularella speciosa	Branching Hydroid	Hydroid	Coral Reefs	Occasional					p
Stichodactyla helianthus	Sun Anemone	Anemone	Reefs	Occasional					p

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Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments	CITES	IUCN	Within Project Area	Within Assessment Area
Zoanthidea	Zoanthid	Hydroid	Reefs, hardbottom	Occasional					p
Zoanthus pulchellus	Mat Zoanthid	Hydroid	Reefs, hardbottom	Occasional					p
CHORDATES									
Ascidiaceae	Tunicate	Tunicate	Reefs and walls	Occasional					p
Botrylloides nigrum	Flat Tunicate	Tunicate	Hardbottom	Occasional					p
Diaemnum vanderhorsti	Black Overgrowing Tunicate	Tunicate	Protected areas of reefs	Occasional					p
CORALS									
Hydrocorals									
Millepora alcicornis	Fire Coral	Coral	Reefs	Abundant	CITES-Endangered			p	p
Millepora complanata	Blade Fire Coral	Coral	Reefs	Common	CITES-Endangered				p
Octocorals									
Antillogorgia americana	Slimy Sea Plume	Coral	Reefs	Occasional					p
Antillogorgia bipinnata	Bipinnate Sea Plume	Coral	Reefs	Common					p
Antillogorgia sp.	Sea Plumes	Coral	Reefs	Abundant					p
Briareum asbestinum	Corky Sea Fingers	Coral	Reefs	Common					p
Eunicea sp.	Sea Rod	Coral	Reefs, walls	Occasional					p
Eunicea mammosa	Swollen-knob Candleabrum	Coral	Shallow hardbottoms, reefs	Occasional					p
Gorgonia ventalina	Common Sea Fan	Coral	Reefs, esp seaward side	Abundant				p	p
Plexaura sp.	Sea Rods	Coral	Reefs	Common					p
Plexaurella homomalla	Black Sea Rods	Coral	Reefs	Occasional					p
Plexaurella nutans	Giant Slit-Pore Sea Rod	Coral	Reefs, hardbottoms	Common					p
Plexaurella sp.	Slit-pore Sea Rod	Coral	Reefs	Common					p
Pseudoplexaura sp.	Porous Sea Rods	Coral	Reefs	Occasional					p
Pseudopterogorgia sp.	Sea Plumes	Coral	Reefs	Abundant	to + 1 meter height				p
Pterogorgia anceps	Angular Sea Whip	Coral	Reefs, hardbottom	Common					p
Pterogorgia citrina	Yellow Sea Whip	Coral	Reefs, hardbottom	Occasional					p

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Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments	CITES	IUCN	Within Project Area	Within Assessment Area
Pterogorgia guadalupensis	Grooved-Blade Sea Whip	Coral	Reefs, hardbottom	Occasional					p
Stony Corals									
Agaricia agaricites	Lettuce Coral	Coral	Reefs	Common	CITES	Yes		p	p
Colpophyllia natans	Boulder Brain Coral	Coral	Reefs	Occasional	Mostly diseased or dead	App II	LC		p
Dendrogyra cylindrus	Pillar Coral	Coral	Reefs	Uncommon	Some over 1.5 meters				p
Dichocoenia stokesii	Elliptical Star Coral	Coral	Reefs	Occasional	Endangered-CITES			p	p
Diploria labyrinthiformis	Grooved Brain Coral	Coral	Reefs	Occasional	Endangered-CITES				p
Eusmilia fastigiata	Smooth Flower Coral	Coral	Reefs	Uncommon	only offshore	App II			p
Favia fragum	Golfball Coral	Coral	Shallow reefs	Occasional		App II			p
Isophyllia rigida	Rough Star Coral	Coral	Reefs	Occasional	CITES	App II			p
Manicina areolata	Rose Coral	Coral	sandy bottoms	Common	Amid seagrasses				p
Meandrina jacksoni	Whitevalley Maze Coral	Coral	Reefs, esp seaward side	Occasional					p
Meandrina meandrites	Maze Coral	Coral	Reefs	Occasional	CITES	App II	LC		p
Montastrea cavernosa	Great Star Coral	Coral	Reefs	Occasional	CITES	App II			p
Orbicella annularis	Boulder Star Coral	Coral	Reefs	Occasional	was Montastrea	App II	Endangered		p
Orbicella faveolata	Mountainous Star Coral	Coral	Reefs	Common					p
Orbicella franksi	Boulder Star Coral	Coral	Reefs	Occasional					p
Mycetophyllia sp.	Cactus Coral	Coral	Reefs	Occasional					p
Porites astreoides	Mustard Hill Coral	Coral	Reefs	Common	Endangered - CITES			p	p
Porites branneri	Blue Crust Coral	Coral	Reefs & grassbeds	Uncommon					p
Porites porites	Finger Coral	Coral	Reefs & grassbeds	Common					p
Porites porites divaricta	Lavender Finger Coral	Coral	Reefs & grassbeds	Uncommon					p
Pseudodiploria clivosa	Knobby Brain	Coral	Reefs	Occasional	CITES				p
Pseudodiploria strigosa	Brain Coral	Coral	Reefs	Occasional	CITES				p
Siderastrea radians	Lesser Starlet Coral	Coral	Hardbottom, sand, reefs	Common					p
Siderastrea sidera	Massive Starlet Coral	Coral	Hardbottom, reefs	Common	Endangered-CITES				p
FISH									

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Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments	CITES	IUCN	Within Project Area	Within Assessment Area
Chaetodon striatus	Banded Butterflyfish	Fish	Reefs	Occasional					p
Chaetodon capristatus	Four-eye Butterflyfish	Fish	Reefs	Occasional					p
Chaetodon ocellatus	Spotfin Butterflyfish	Fish	Reefs	Occasional					p
Holacanthus ciliaris	Queen Angelfish	Fish	Reefs	Occasional					p
Pomacanthus arcuatus	Gray Angelfish	Fish	Reefs	Occasional					p
Holacanthus tricolor	Rock Beauty	Fish	Reefs	Occasional					p
Acanthurus caeruleus	Blue Tang	Fish	Reefs	Abundant				p	p
Acanthurus chirurgus	Doctorfish	Fish	Reefs	Occasional				p	
Caranx bartholomaei	Yellow Jack	Fish	Over reefs	Uncommon					p
Caranx ruber	Bar Jack	Fish	Over reefs	Common					p
Trachinotus falcatus	Permit	Fish	Over sand & reefs	Uncommon	Saw over nearshore reefs				p
Sphyraena barracuda	Great Barracuda	Fish	Reefs & Sandy bottoms	Common	Over grassbeds & reefs			p	p
Albula vulpies	Bonefish	Gamefish	Shallow flats	Occasional	Schooling inside point			p	p
Calamus sp.	Porgy	Fish	Reefs & Sandy bottoms	Common					p
Kyphosus sectratrix	Chub	Fish	Over reefs	Common					p
Gerres cinereus	Yellowfin Mojarra	Fish	Sand near reefs	Occasional					p
Atherinidae, Clupeidae	Silversides, Herrings, Anchovies	Fish	Reefs, mangroves	Common	Schools of thousands				p
Haemulon flavolineatum	French Grunt	Fish	Nearshore reefs	Common					p
Haemulon melanurum	Cottonwick	Fish	Nearshore reefs	Common					p
Haemulon sciurus	Blue-striped Grunt	Fish	Nearshore reefs	Abundant					p
Haemulon sp.	Grunt	Fish	Reefs	Abundant				p	p
Anisotremus virginicus	Porkfish	Fish	Reefs	Common				p	p
Anisotremus surinamensis	Black Margate	Fish	Rocky areas, reefs	Occasional					p
Haemulon album	Margate	Fish	Rocky areas, reefs	Occasional					p
Lutjanus jocu	Dog Snapper	Fish	Reefs	Occasional				p	p
Lutjanus apodus	Schoolmaster	Fish	Reefs	Common	mostly in mangroves			p	p

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Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments	CITES	IUCN	Within Project Area	Within Assessment Area
Lutjanus sp.	Snapper	Fish	Reefs	Occasional					**p**
Ocyurus chrysurus	Yellow-tail Snapper	Fish	Reefs	Common				**p**	**p**
Stegastes fuscus	Dusky Damselfish	Fish	Reefs	Occasional	incl juveniles				**p**
Stegastes partitus	Bicolor Damselfish	Fish	Reefs	Occasional					**p**
Stegastes leucostictus	Beaugregory	Fish	Reefs, hardbottom	Common				**p**	**p**
Stegastes variabilis	Cocoa Damselfish	Fish	Reefs, hardbottom	Occasional				**p**	**p**
Microspathodon chrysurus	Yellow-tail Damselfish	Fish	Reefs	Occasional					**p**
Abudefduf saxatilis	Sergeant Major	Fish	Rocks, shorelines	Common					**p**
Chromis cyanea	Blue Chromis	Fish	Reefs	Common					**p**
Hypoplecturus unicolor	Butter Hamlet	Fish	Reefs	Occasional					**p**
Epinephelus striatus	Nassau Grouper	Fish	Reef ledges	Occasional		?	Critically Endangered		**p**
Epinephelus sp.	Hind	Fish	Reef ledges	Occasional					**p**
Epinephelus guttatus	Red Hind	Fish	Patch reefs	Occasional					**p**
Epinephelus fulvus	Coney	Fish	Patch reefs	Occasional					**p**
Serranus tigrinus	Harlequin bass	Fish	Reefs, hardbottom	Occasional				**p**	**p**
Sparisoma viridae	Stoplight Parrotfish	Fish	Reefs	Common					**p**
Scarus coeruleus	Blue Parrotfish	Fish	Reefs	Occasional					**p**
Sparisoma rubripinne	Yellowtail Parrotfish	Fish	Reefs	Occasional					**p**
Scarus vetula	Queen Parrotfish	Fish	Reefs	Occasional				**p**	**p**
Lachnolaimus maximus	Hogfish	Fish	Open bottoms, reefs	Common	Vulnerable - IUCN			**p**	**p**
Bodianus rufus	Spanish Hogfish	Fish	Reefs	Occasional					**p**
Halichoeres garnoti	Yl-head Wrasse	Fish	Reefs	Occasional					**p**
Thalassoma bifasciatum	Bluehead Wrasse	Fish	Reefs	Abundant				**p**	**p**
Halichoeres bivittatus	Slippery Dick	Fish	Reefs, grassbeds	Common					**p**
Holocentrus rufus	Longspine Squirrelfish	Fish	Crevices in reef/rocks	Common					**p**
Holocentrus sp.	Squirrelfish	Fish	Crevices in reef/rocks	Common					**p**

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Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments	CITES	IUCN	Within Project Area	Within Assessment Area
Myripristis jacobus	Blackbar Soldierfish	Fish	Recesses in reefs	Uncommon					p
Bothus lunatus	Peacock Flounder	Fish	Sandy Bottoms	Occasional					p
Synodus saurus	Bluestripe Lizardfish	Fish	Rubbly bottoms	Occasional					p
Canthigaster rostrata	Sharpnose Puffer	Fish	Reefs, seagrass beds	Occasional					p
Acanthostracion polygonius	Honeycomb Cowfish	Fish	Over rubble	Occasional					p
Malacanthus plumieri	Sand Tilefish	Fish	SAV nr patch reefs	Uncommon					p
Balistes vetula	Queen Triggerfish	Fish	Reef tops, coral rubble	Uncommon			Vulnerable		p
Canthidermis sufflamen	Ocean Triggerfish	Fish	Reef tops, coral rubble	Uncommon					p
Melichthys niger	Black Durgon	Fish	Reefs, coral rubble	Uncommon	Only over deep reefs				p
Cantherhines pullus	Orangespotted Filefish	Fish	Reefs	Uncommon					p
Pseudupeneus maculatus	Spotted Goatfish	Fish	Sandy bottoms	Uncommon					p
Istiophorus platypterus	Sailfish	Fish	Offshore, Pelagic	Uncommon					p
Negaprion brevirostris	Lemon Shark	Shark	Sandy bottoms, Hardbottom	Uncommon					p
Carcharhinus perezii	Reef Shark	Shark	Reefs and shallows	Uncommon					p
REPTILES									
Chelonia mydas	Green Turtle	Turtle	Reefs	Occasional			Endangered		p

Note: LC = Least Concern

Appendix C

Convention on International Trade in Endangered Species of Wild Fauna and Flora

Species Observed at Calypso Cove Site during Field Assessments for the EIA Are Highlighted

FAUNA

Acanthopathes humilis **II** APHANIPATHIDAE (Anthozoa)
Accipiter striatus **II** [31] ACCIPITRIDAE (Aves) (E) Sharp-shinned Hawk
Acropora cervicornis **II** ACROPORIDAE (Anthozoa) (E) Staghorn Coral
Acropora palmata **II** ACROPORIDAE (Anthozoa) (E) Elkhorn Coral
Acropora prolifera **II** ACROPORIDAE (Anthozoa) (E) Fused Staghorn Coral
Agaricia agaricites **II** AGARICIIDAE (Anthozoa) (E) Leaf Coral, Lettuce Coral
Agaricia fragilis **II** AGARICIIDAE (Anthozoa) (E) Fragile Saucer Coral
Alopias superciliosus **II** ALOPIIDAE (Elasmobranchii) (E) Bigeye thresher, Bigeye thresher shark, False thresher, Long-tailed shark, Whiptail
Alopias vulpinus **II** ALOPIIDAE (Elasmobranchii) (E) Atlantic thresher, Common thresher, Common thresher shark, Fox shark, Grayfish, Green thresher, Sea fox, Slasher, Swingletail, Swiveltail, Thintail thresher, Thrasher, Thresher shark, Whip-tailed shark, Zorro thresher shark
Amazona leucocephala **I** PSITTACIDAE (Aves) (E) Bahamas Parrot, Caribbean Amazon, Cuban Amazon, Cuban Parrot
Amazon, Caribbean (E): *Amazona leucocephala*
Amazon, Cuban (E): *Amazona leucocephala*
Anomocora fecunda **II** CARYOPHYLLIIDAE (Anthozoa) (E) Prolific Coral
Anthemiphyllia patera **II** ANTHEMIPHYLLIIDAE (Anthozoa)
Anthracothorax prevostii **II** TROCHILIDAE (Aves) (E) Green-breasted Mango
Antipathes atlantica **II** ANTIPATHIDAE (Anthozoa) (E) Grey Sea-fan Black Coral
Antipathes caribbeana **II** ANTIPATHIDAE (Anthozoa) (E) King's Black Coral
Antipathes furcata **II** ANTIPATHIDAE (Anthozoa) (E) Branched Bottle-brush Black Coral
Antipathes umbratica **II** ANTIPATHIDAE (Anthozoa)
Archilochus colubris **II** TROCHILIDAE (Aves) (E) Ruby-throated Hummingbird
Asio flammeus **II** [35] STRIGIDAE (Aves) (E) Short-eared Owl
Astrangia solitaria **II** RHIZANGIIDAE (Anthozoa) (E) Dwarf Cup Coral
Athene cunicularia **II** [35] STRIGIDAE (Aves) (E) Burrowing Owl
Balaenoptera acutorostrata **I/II** [24] BALAENOPTERIDAE (Mammalia) (E) Common minke whale, Dwarf minke whale, Lesser Rorqual, Little Piked Whale, Minke Whale, Northern Minke Whale
Balanophyllia cyathoides **II** DENDROPHYLLIIDAE (Anthozoa)
Balanophyllia palifera **II** DENDROPHYLLIIDAE (Anthozoa) (E) Chaff Cup Coral
Balanophyllia wellsi **II** DENDROPHYLLIIDAE (Anthozoa)
Barn-Owl, Common (E): *Tyto alba*
Blackfish (E): *Globicephala macrorhynchus*
Boa, Abaco Island (E): *Chilabothrus exsul*
Boa, Bahamas Islands (E): *Chilabothrus chrysogaster*
Boa, Cuban (E): *Chilabothrus angulifer*
Boa, Cuban Tree (E): *Chilabothrus angulifer*
Boa, Fischer's Tree (E): *Chilabothrus striatus*
Boa, Fischer's Tree (E): *Chilabothrus strigilatus*
Boa, Great Inagua Island Dwarf (E): *Tropidophis curtus*
Boa, Great Inagua Island Dwarf (E): *Tropidophis canus*
Boa, Haitian (E): *Chilabothrus striatus*
Boa, Haitian (E): *Chilabothrus strigilatus*
Boa, Turks Islands (E): *Chilabothrus chrysogaster*
Burhinus bistriatus **III** BURHINIDAE (Aves) (E) Double-striped Thick-knee
Buteo jamaicensis **II** [31] ACCIPITRIDAE (Aves) (E) Red-tailed Hawk
Cachalot (E): *Physeter macrocephalus*
Cachelot (E): *Physeter macrocephalus*
Calliphlox evelynae **II** TROCHILIDAE (Aves) (E) Bahama Woodstar
Carcharodon carcharias **II** LAMNIDAE (Elasmobranchii) (E) Great White Shark, Man-eater Shark, Mango-taniwha, Mango-ururoa, White-death, White Pointer, White Shark
Carduelis flammea **III** FRINGILLIDAE (Aves) (E) Common Redpoll, Redpoll
Caretta caretta **I** CHELONIIDAE (Reptilia) (E) Loggerhead, Loggerhead turtle
Caryophyllia ambrosia **II** CARYOPHYLLIIDAE (Anthozoa)
Caryophyllia antillarum **II** CARYOPHYLLIIDAE (Anthozoa) (E) Antillean Horn Coral
Caryophyllia berteriana **II** CARYOPHYLLIIDAE (Anthozoa) (E) Beautiful Horn Coral
Caryophyllia corrugata **II** CARYOPHYLLIIDAE (Anthozoa) (E) Corrugated Coral
Caryophyllia crypta **II** CARYOPHYLLIIDAE (Anthozoa) (E) Cryptic Coral
Chelonia mydas **I** CHELONIIDAE (Reptilia) (E) Green Turtle
Chilabothrus angulifer **II** BOIDAE (Reptilia) (E) Cuban Boa, Cuban Tree Boa
Chilabothrus chrysogaster **II** BOIDAE (Reptilia) (E) Bahamas Islands Boa, Turks Islands Boa
Chilabothrus exsul **II** BOIDAE (Reptilia) (E) Abaco Island Boa
Chilabothrus striatus **II** BOIDAE (Reptilia) (E) Fischer's Tree Boa, Haitian Boa
Chilabothrus strigilatus **II** BOIDAE (Reptilia) (E) Fischer's Tree Boa, Haitian Boa
Chlorostilbon ricordii **II** TROCHILIDAE (Aves) (E) Cuban Emerald
Circus cyaneus **II** [31] ACCIPITRIDAE (Aves) (E) Hen Harrier, Marsh Hawk, Northern Harrier
Cladopsammia manuelensis **II** DENDROPHYLLIIDAE (Anthozoa)
coarl, Ridged cactus (E): *Mycetophyllia lamarckiana*

Coral, Ten-ray Star (E): *Madracis decactis*

Coral, Tuft (E): *Lophelia pertusa*

Coral, Twelve-root Cup (E): *Polymyces fragilis*

Coral, Two-tone Cup (E): *Phacelocyathus flos*

Coral, Variable Cup (E): *Tethocyathus variabilis*

Coral, Worm (E): *Stenocyathus vermiformis*

Coral, Yellow Pencil (E): *Madracis myriaster*

Cyclura carinata **I** IGUANIDAE (Reptilia) (E) Bahamas Rock Iguana, Bartsch's Iguana, Turks and Caicos Ground Iguana, Turks and Caicos Iguana, Turks and caicos rock iguana, Turks Island iguana

Cyclura cychlura **I** IGUANIDAE (Reptilia) (E) Bahamas Iguana, Bahamas Rock Iguana, Northern bahamian rock iguana

Cyclura rileyi **I** IGUANIDAE (Reptilia) (E) Acklin's ground iguana, Central Bahamian rock iguana, San Salvador Ground Iguana, San Salvador Iguana, Watling Island Iguana, White Cay Ground Iguana

Deltocyathus calcar **II** CARYOPHYLLIIDAE (Anthozoa) (E) Deepsea Star Coral

Deltocyathus eccentricus **II** CARYOPHYLLIIDAE (Anthozoa) (E) Eccentric Star Coral

Deltocyathus italicus **II** CARYOPHYLLIIDAE (Anthozoa) (E) Conical Star Coral

Deltocyathus moseleyi **II** CARYOPHYLLIIDAE (Anthozoa)

Deltocyathus pourtalesi **II** CARYOPHYLLIIDAE (Anthozoa)

Dendrocygna arborea **II** ANATIDAE (Aves) (E) Black-billed Wood-Duck, Cuban Tree-Duck, West Indian Tree-Duck, West indian whistling duck, West Indian Whistling-Duck

Dendrocygna autumnalis **III** ANATIDAE (Aves) (E) Black-bellied whistling duck, Black-bellied Whistling-Duck, Red-billed Whistling-Duck

Dendrocygna bicolor **III** ANATIDAE (Aves) (E) Fulvous duck, Fulvous Tree-Duck, Fulvous whistling duck, Fulvous Whistling-Duck

Dendrogyra cylindrus **II** MEANDRINIIDAE (Anthozoa) (E) Pillar Coral

Dendrophyllia alternata **II** DENDROPHYLLIIDAE (Anthozoa)

Dermochelys coriacea **I** DERMOCHELYIDAE (Reptilia) (E) Coffin-back, Leatherback, Leatherback sea turtle, Leatherback Turtle, Leathery Turtle, Luth, Luth Turtle, Trunkback Turtle, Trunk turtle

Desmophyllum dianthus **II** CARYOPHYLLIIDAE (Anthozoa) (E) Cockscomb Cup Coral

Desmophyllum striatum **II** CARYOPHYLLIIDAE (Anthozoa) (E) Striated Cup Coral

devilray, Atlantic (E): *Mobula hypostoma*

Dichocoenia stokesii **II** MEANDRINIIDAE (Anthozoa) (E) Elliptical Star Coral, Pineapple Coral

Diploria clivosa **II** FAVIIDAE (Anthozoa) (E) Knobby Brain Coral

Diploria labyrinthiformis **II** FAVIIDAE (Anthozoa) (E) Common Brain Coral, Grooved Brain Coral

Diploria strigosa **II** FAVIIDAE (Anthozoa) (E) Symmetrical Brain Coral

Distichopathes filix **II** APHANIPATHIDAE (Anthozoa)

Distichopora sulcata **II** STYLASTERIDAE (Hydrozoa)

Dolphin, Atlantic Spinner (E): *Stenella clymene*

Dolphin, Atlantic Spotted (E): *Stenella frontalis*

Dolphin, Bottlenose (E): *Tursiops truncatus*

dolphin, Bottlenosed (E): *Tursiops truncatus*

Dolphin, Bottle-nosed (E): *Tursiops truncatus*

Dolphin, Bridled (E): *Stenella attenuata*

Dolphin, Clymene (E): *Stenella clymene*

dolphin, Common bottlenose (E): *Tursiops truncatus*

dolphin, Electra (E): *Peponocephala electra*

Dolphin, Grey (E): *Grampus griseus*

Dolphin, Helmet (E): *Stenella clymene*

Dolphin, Long-beaked (E): *Stenella longirostris*

Dolphin, Long-snouted (E): *Stenella longirostris*

Dolphin, Narrow-snouted (E): *Stenella attenuata*

Dolphin, Pantropical Spotted (E): *Stenella attenuata*

Dolphin, Risso's (E): *Grampus griseus*

Dolphin, Rough-toothed (E): *Steno bredanensis*

Dolphin, Short-beaked Bottlenose (E): *Tursiops truncatus*

Dolphin, Spinner (E): *Stenella longirostris*

duck, Black-bellied whistling (E): *Dendrocygna autumnalis*

duck, Fulvous (E): *Dendrocygna bicolor*

duck, Fulvous whistling (E): *Dendrocygna bicolor*

duck, West indian whistling (E): *Dendrocygna arborea*

Eagle, Bald (E): *Haliaeetus leucocephalus*

Eagle, White-headed (E): *Haliaeetus leucocephalus*

Eguchipsammia cornucopia **II** DENDROPHYLLIIDAE (Anthozoa)

Elanoides forficatus **II** [31] ACCIPITRIDAE (Aves) (E) American Swallow-tailed Kite, Swallow-tailed Kite

Elatopathes abietina **II** APHANIPATHIDAE (Anthozoa) (E) Spear Black Coral

Emerald, Cuban (E): *Chlorostilbon ricordii*

Enallopsammia rostrata **II** DENDROPHYLLIIDAE (Anthozoa) (E) Beaked Cup Coral

Eretmochelys imbricata **I** CHELONIIDAE (Reptilia) (E) Hawksbill Turtle

Errina cochleata **II** STYLASTERIDAE (Hydrozoa)

estrella, Coral (E): *Madracis pharensis*

Eubalaena glacialis **I** BALAENIDAE (Mammalia) (E) Black Right Whale, North Atlantic right whale, Northern Right Whale, Right Whale

Eusmilia fastigiata **II** CARYOPHYLLIIDAE (Anthozoa) (E) Smooth Flower Coral

Falco columbarius **II** [31] FALCONIDAE (Aves) (E) Merlin, Pigeon Hawk

Falcon, Peregrine (E): *Falco peregrinus*

Falco peregrinus **I** FALCONIDAE (Aves) (E) Duck Hawk, Peregrine, Peregrine Falcon

Falco sparverius **II** [31] FALCONIDAE (Aves) (E) American Kestrel

Favia fragum **II** FAVIIDAE (Anthozoa) (E) Golfball Coral, Small Star Coral

Flabellum atlanticum **II** FLABELLIDAE (Anthozoa)

Flamingo, American (E): *Phoenicopterus ruber*

Flamingo, American (E): *Phoenicopterus roseus*

Flamingo, Caribbean (E): *Phoenicopterus roseus*

Flamingo, Caribbean (E): *Phoenicopterus ruber*

flamingo, Greater (E): *Phoenicopterus roseus*

fox, Sea (E): *Alopias vulpinus*

FLORA

Annotations key

Annotations not preceded by "#"

1 ***Antilocapra americana***

Only the population of Mexico is included in Appendix I. No other population is included in the Appendices.

2 ***Bos gaurus***

Excludes the domesticated form, which is referenced as *Bos frontalis*, and is not subject to the provisions of the Convention.

3 ***Bos mutus***

Excludes the domesticated form, which is referenced as *Bos grunniens*, and is not subject to the provisions of the Convention.

4 ***Bubalus arnee***

Excludes the domesticated form, which is referenced as *Bubalus bubalis* and is not subject to the provisions of the Convention.

5 ***Ovis canadensis***

Only the population of Mexico; no other population is included in the Appendices.

6 ***Ovis gmelini***

Only the population of Cyprus; no other population is included in the Appendices

7 ***Saiga borealis***

A zero export quota for wild specimens traded for commercial purposes

8 ***Saiga tatarica***

A zero export quota for wild specimens traded for commercial purposes

9 ***Vicugna vicugna***

Only the populations of Argentina (the populations of the Provinces of Jujuy, Catamarca and Salta, and the semi-captive populations of the Provinces of Jujuy, Salta, Catamarca, La Rioja and San Juan), Chile (populations of the region of Tarapacá and of the region of Arica and Parinacota), Ecuador (the whole population), Peru (the whole population) and the Plurinational State of Bolivia (the whole population); all other populations are included in Appendix I.

For the exclusive purpose of allowing international trade in fibre from vicuñas (*Vicugna vicugna*) and their derivative products, only if the fibre comes from the shearing of live vicuñas. Trade in products derived from the fibre may only take place in accordance with the following provisions:
a) Any person or entity processing vicuña fibre to manufacture cloth and garments must request authorization from the relevant authorities of the country of origin (Countries of origin: The countries where the species occurs, that is, Argentina, Bolivia, Chile, Ecuador and Peru) to use the "vicuña country of origin" wording, mark or logo adopted by the range States of the species that are signatories to the Convention for the Conservation and Management of the Vicuña.
b) Marketed cloth or garments must be marked or identified in accordance with the following provisions:
i) For international trade in cloth made from live-sheared vicuña fibre, whether the cloth was produced within or outside of the range States of the species, the wording, mark or logo must be used so that the country of origin can be identified. The VICUÑA [COUNTRY OF ORIGIN] wording, mark or logo has the format as detailed below:

This wording, mark or logo must appear on the reverse side of the cloth. In addition, the selvages of the cloth must bear the words VICUÑA [COUNTRY OF ORIGIN].
ii) For international trade in garments made from live-sheared vicuña fibre, whether the garments were produced within or outside of the range States of the species, the wording, mark or logo indicated in paragraph b) i) must be used. This wording, mark or logo must appear on a label on the garment itself. If the garments are produced outside of the country of origin, the name of the country where the garment was produced should also be indicated, in addition to the wording, mark or logo referred to in paragraph b) i).
c) For international trade in handicraft products made from live-sheared vicuña fibre produced within the range

States of the species, the VICUÑA [COUNTRY OF ORIGIN] - ARTESANÍA wording, mark or logo must be used as detailed below:

d) If live-sheared vicuña fibre from various countries of origin is used for the production of cloth and garments, the wording, mark or logo of each of the countries of origin of the fibre must be indicated, as detailed in paragraphs b) i) and ii).
e) All other specimens shall be deemed to be specimens of species listed in Appendix I and the trade in them shall be regulated accordingly.

10 ***Moschus* spp.**

The populations of Afghanistan, Bhutan, India, Myanmar, Nepal and Pakistan are included in Appendix I. All other populations are included in Appendix II.

10 ***Moschus* spp.**

Except the populations of Afghanistan, Bhutan, India, Myanmar, Nepal and Pakistan, which are included in Appendix I.

11 **TAYASSUIDAE spp.**

Except the species included in Appendix I (*Catagonus wagneri*) and the populations of *Pecari tajacu* of Mexico and the United States of America, which are not included in the Appendices.

12 ***Canis lupus***

Except the populations of Bhutan, India, Nepal and Pakistan, which are included in Appendix I. Excludes the domesticated form and the dingo which are referenced as *Canis lupus familiaris* and *Canis lupus dingo*.

13 **FELIDAE spp.**

Included in Appendix II, except for the species included in Appendix I. Specimens of the domesticated form are not subject to the provisions of the Convention.

14 ***Acinonyx jubatus***

Included in Appendix I. Annual export quotas for live specimens and hunting trophies are granted as follows: Botswana: 5; Namibia: 150; Zimbabwe: 50. The trade in such specimens is subject to the provisions of Article III of the Convention.

15 ***Caracal caracal***

Except the Asian population, which is included in Appendix I.

16 ***Herpailurus yagouaroundi***

Only the populations of Central and North America; all other populations are included in Appendix II.

17 ***Panthera leo***

[FAMILY listing Felidae spp.]

For *Panthera leo* (African populations): a zero annual export quota is established for specimens of bones, bone pieces, bone products, claws, skeletons, skulls and teeth removed from the wild and traded for commercial purposes. Annual export quotas for trade in bones, bone pieces, bone products, claws, skeletons, skulls and teeth for commercial purposes, derived from captive breeding operations in South Africa, will be established and communicated annually to the CITES Secretariat.

17 ***Panthera leo***

Only the populations of India; all other populations are included in Appendix II.

18 ***Prionailurus bengalensis bengalensis***

Except the populations of Bangladesh, India and Thailand, which are included in Appendix I.

19 ***Prionailurus rubiginosus***

Except the population of India, which is included in Appendix I.

19 ***Prionailurus rubiginosus***

Only the population of India; all other populations are included in Appendix II.

20 ***Puma concolor***

Only the populations of Costa Rica and Panama; all other populations are included in Appendix II

[21] ***Aonyx capensis microdon***

Only the populations of Cameroon and Nigeria; all other populations are included in Appendix II.

[22] ***Ursus arctos***

Except the populations of Bhutan, China, Mexico and Mongolia, which are included in Appendix I.

[22] ***Ursus arctos***

Only the populations of Bhutan, China, Mexico and Mongolia; all other populations are included in Appendix II.

[23] **CETACEA spp.**

Included in Appendix II, except for the species included in Appendix I. A zero annual export quota has been established for live specimens from the Black Sea population of Tursiops truncatus removed from the wild and traded for primarily commercial purposes.

[24] ***Balaenoptera acutorostrata***

Population of West Greenland.

[25] ***Pteropus* spp.**

Except *Pteropus brunneus* and the species included in Appendix I.

[26] ***Chaetophractus nationi***

Included in Appendix II. A zero annual export quota has been established. All specimens shall be deemed to be specimens of species included in Appendix I and the trade in them shall be regulated accordingly.

[27] ***Equus africanus***

Excludes the domesticated form, which is referenced as *Equus asinus* and is not subject to the provisions of the Convention.

[28] ***Ceratotherium simum simum***

Only the populations of Eswatini, Namibia and South Africa; all other populations are included in Appendix I. The populations of Eswatini and South Africa are included in Appendix II for the exclusive purpose of allowing international trade in live animals to appropriate and acceptable destinations and hunting trophies. The population of Namibia is included in Appendix II for the exclusive purpose of allowing international trade in live animals for *in-situ* conservation only, and only within the natural and historical range of *Ceratotherium simum* in Africa. All other specimens shall be deemed to be specimens of species included in Appendix I and the trade in them shall be regulated accordingly.

[29] ***Loxodonta africana***

The populations of Botswana, Namibia, South Africa and Zimbabwe are listed in Appendix II for the exclusive purpose of allowing:

a) trade in hunting trophies for non-commercial purposes;
b) trade in live animals to appropriate and acceptable destinations, as defined in Resolution Conf. 11.20 (Rev. CoP18), for Botswana and Zimbabwe and for *in situ* conservation programmes for Namibia and South Africa;
c) trade in hides;
d) trade in hair;
e) trade in leather goods for commercial or non-commercial purposes for Botswana, Namibia and South Africa and for non-commercial purposes for Zimbabwe;
f) trade in individually marked and certified ekipas incorporated in finished jewellery for non-commercial purposes for Namibia and ivory carvings for non-commercial purposes for Zimbabwe;
g) trade in registered raw ivory (for Botswana, Namibia, South Africa and Zimbabwe, whole tusks and pieces) subject to the following:
i) only registered government-owned stocks, originating in the State (excluding seized ivory and ivory of unknown origin);
ii) only to trading partners that have been verified by the Secretariat, in consultation with the Standing Committee, to have sufficient national legislation and domestic trade controls to ensure that the imported ivory will not be re-exported and will be managed in accordance with all requirements of Resolution Conf. 10.10 (Rev. CoP18) concerning domestic manufacturing and trade;
iii) not before the Secretariat has verified the prospective importing countries and the registered government-owned stocks;
iv) raw ivory pursuant to the conditional sale of registered government-owned ivory stocks agreed at CoP12, which are 20,000 kg (Botswana), 10,000 kg (Namibia) and 30,000 kg (South Africa);
v) in addition to the quantities agreed at CoP12, government-owned ivory from Botswana, Namibia, South Africa and Zimbabwe registered by 31 January 2007 and verified by the Secretariat may be traded and despatched, with

the ivory in paragraph g) iv) above, in a single sale per destination under strict supervision of the Secretariat;
vi) the proceeds of the trade are used exclusively for elephant conservation and community conservation and development programmes within or adjacent to the elephant range; and
vii) the additional quantities specified in paragraph g) v) above shall be traded only after the Standing Committee has agreed that the above conditions have been met; and
h) no further proposals to allow trade in elephant ivory from populations already in Appendix II shall be submitted to the Conference of the Parties for the period from CoP14 and ending nine years from the date of the single sale of ivory that is to take place in accordance with provisions in paragraphs g) i), g) ii), g) iii), g) vi) and g) vii). In addition such further proposals shall be dealt with in accordance with Decisions 16.55 and 14.78 (Rev. CoP16).

On a proposal from the Secretariat, the Standing Committee can decide to cause this trade to cease partially or completely in the event of non-compliance by exporting or importing countries, or in the case of proven detrimental impacts of the trade on other elephant populations.

All other specimens shall be deemed to be specimens of species included in Appendix I and the trade in them shall be regulated accordingly.

30 ***Chinchilla* spp.**

Specimens of the domesticated form are not subject to the provisions of the Convention

31 **FALCONIFORMES spp.**

Except *Caracara lutosa* and the species of the family Cathartidae, which are not included in the Appendices; and the species included in Appendices I and III.

32 ***Falco newtoni***

Except the population of the Seychelles, which is included in Appendix I.

32 ***Falco newtoni***

Only the population of Seychelles.

33 ***Pycnonotus zeylanicus***

Entry into effect delayed by 12 months, i.e. until 25 November 2023.

34 **PSITTACIFORMES spp.**

Included in Appendix II, except for the species included in Appendix I and *Agapornis roseicollis, Melopsittacus undulatus, Nymphicus hollandicus* and *Psittacula krameri*, which are not included in the Appendices.

35 **STRIGIFORMES spp.**

Except *Sceloglaux albifacies* and the species included in Appendix I.

36 ***Struthio camelus***

Only the populations of Algeria, Burkina Faso, Cameroon, the Central African Republic, Chad, Mali, Mauritania, Morocco, Niger, Nigeria, Senegal and Sudan are included in Appendix I. No other population is included in the Appendices.

37 ***Caiman latirostris***

Except the population of Argentina, which is included in Appendix II, and the population of Brazil, which is included in Appendix II subject to a zero annual export quota for wild specimens traded for commercial purposes.

37 ***Caiman latirostris***

Population of Argentina, included in CROCODYLIA spp., and population of Brazil, included in CROCODYLIA spp. and subject to a zero annual export quota for wild specimens traded for commercial purposes.

38 ***Crocodylus acutus***

Population of the Integrated Management District of Mangroves of the Bay of Cispata, Tinajones, La Balsa and Surrounding Areas, Department of Córdoba, Colombia, and the population of Cuba; and the population of Mexico, which is subject to a zero export quota for wild specimens for commercial purposes

39 ***Crocodylus moreletii***

Only the population of Belize, which is included in Appendix II with a zero quota for wild specimens traded for commercial purposes, and the population of Mexico.

40 ***Crocodylus niloticus***

Included in Appendix I, except the populations of Botswana, Egypt (subject to a zero quota for wild specimens traded for commercial purposes), Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Namibia, South Africa, Uganda, the United Republic of Tanzania (subject to an annual export quota of no more than 1,600 wild specimens including hunting trophies, in addition to ranched specimens), Zambia and Zimbabwe, which are included in Appendix II

40 ***Crocodylus niloticus***

Populations of Botswana, Egypt (subject to a zero quota for wild specimens traded for commercial purposes), Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Namibia, South Africa, Uganda, the United Republic of Tanzania (subject to an annual export quota of no more than 1,600 wild specimens including hunting trophies, in addition to ranched specimens), Zambia and Zimbabwe.

41 ***Crocodylus porosus***

Except the populations of Australia, Indonesia, Malaysia [wild harvest restricted to the State of Sarawak and a zero quota for wild specimens for the other States of Malaysia (Sabah and Peninsular Malaysia), with no change in the zero quota unless approved by the Parties], Papua New Guinea and the Philippines [population of the Palawan Islands only, subject to a zero annual export quota for wild specimens traded for commercial purposes], which are included in Appendix II.

42 ***Ceratophora aspera***

Zero export quota for wild specimens for commercial purposes

43 ***Ceratophora stoddartii***

Zero export quota for wild specimens for commercial purposes

44 ***Lyriocephalus scutatus***

Zero export quota for wild specimens for commercial purposes

45 ***Abronia* spp.**

Except the species included in Appendix I. Zero export quota for wild specimens for *Abronia aurita, A. gaiophantasma, A. montecristoi, A. salvadorensis* and *A. vasconcelosii*.

46 **LANTHANOTIDAE spp.**

Zero export quota for wild specimens for commercial purposes.

47 ***Vipera ursinii***

Only the population of Europe, except the area which formerly constituted the Union of Soviet Socialist Republics; these latter populations are not included in the Appendices.

48 ***Chelodina mccordi***

Zero export quota for specimens from the wild.

49 ***Chelus fimbriatus***

50 ***Batagur borneoensis***

Zero quota for wild specimens for commercial purposes.

51 ***Batagur trivittata***

Zero quota for wild specimens for commercial purposes.

52 ***Heosemys annandalii***

Zero quota for wild specimens for commercial purposes.

53 ***Heosemys depressa***

Zero quota for wild specimens for commercial purposes.

54 ***Orlitia borneensis***

Zero quota for wild specimens for commercial purposes.

55 **TESTUDINIDAE spp.**

Included in Appendix II, except for the species included in Appendix I. A zero annual export quota has been established for *Centrochelys sulcata* for specimens removed from the wild and traded for primarily commercial purposes.

56 ***Agalychnis* spp.**

Includes *Agalychnis annae*, *A. callidryas*, *A. lemur* [subject to a zero annual export quota for wild-taken specimens traded for commercial purposes], *A. moreletti*, *A. saltator*, *A. spurrelli* and *A. terranova*.

57 ***Rheobatrachus* spp.**

Except *Rheobatrachus silus* and *Rheobatrachus vitellinus*.

58 ***Laotriton laoensis***

Included in Appendix II subject to a zero annual export quota for wild-taken specimens traded for commercial purposes.

59 ***Hypancistrus zebra***

Included in Appendix II subject to a zero export quota for wild specimens for commercial purposes.

60 ***Holothuria fuscogilva***

Entry into effect delayed by 12 months, i.e. until 28 August 2020

61 ***Holothuria nobilis***

Entry into effect delayed by 12 months, i.e. until 28 August 2020

62 ***Holothuria whitmaei***

Entry into effect delayed by 12 months, i.e. until 28 August 2020

63 ***Caribena versicolor***

Listed by the European Union

64 ***Papilio phorbanta***

Listed by the European Union

65 ***Panax ginseng***

Only the population of the Russian Federation; no other population is included in the Appendices.

66 **CACTACEAE spp.**

Except the species included in Appendix I and except *Pereskia* spp., *Pereskiopsis* spp. and *Quiabentia* spp. Artificially propagated specimens of the following hybrids and/or cultivars are not subject to the provisions of the Convention: *Hatiora* x *graeseri*; *Schlumbergera* x *buckleyi*; *Schlumbergera russelliana* x *Schlumbergera truncata*; *Schlumbergera orssichiana* x *Schlumbergera truncata*; *Schlumbergera opuntioides* x *Schlumbergera truncata*; *Schlumbergera truncata* (cultivars); Cactaceae spp. colour mutants grafted on the following grafting stocks *Harrisia* 'Jusbertii', *Hylocereus trigonus* or *Hylocereus undatus*; *Opuntia microdasys* (cultivars).

67 ***Dicksonia* spp.**

Only the populations of the Americas; no other population is included in the Appendices

68 ***Diospyros* spp.**

Populations of Madagascar.

69 ***Euphorbia* spp.**

Succulent species only except *Euphorbia misera* and the species included in Appendix I.
Artificially propagated specimens of cultivars of *Euphorbia trigona*, artificially propagated specimens of crested, fanshaped or colour mutants of *Euphorbia lactea*, when grafted on artificially propagated root stock of *Euphorbia neriifolia*, and artificially propagated specimens of cultivars of *Euphorbia* 'Milii' when they are traded in shipments of 100 or more plants and readily recognizable as artificially propagated specimens, are not subject to the provisions of the Convention.

70 ***Euphorbia cremersii***

Included in Appendix I. Includes the forma *viridifolia* and the variety *rakotozafyi*.

71 ***Euphorbia cylindrifolia***

Included in Appendix I. Includes the subspecies *tuberifera*.

72 ***Euphorbia decaryi***

Included in Appendix I. Includes the varieties *ampanihyensis, robinsonii and spirosticha*.

73 ***Euphorbia moratii***

Included in Appendix I. Includes the varieties *antsingiensis, bemarahensis* and *multiflora*.

74 ***Aloe* spp.**

Except the species included in Appendix I. Also excludes *Aloe vera*, also referenced as *Aloe barbadensis* which is not included in the Appendices.

75 ***Aloe compressa***

Included in Appendix I. Includes the varieties *paucituberculata, rugosquamosa* and *schistophila*.

76 ***Aloe haworthioides***

Included in Appendix I. Includes the variety *aurantiaca*.

77 ***Aloe laeta***

Included in Appendix I. Includes the variety *maniaensis*.

78 ***Cedrela* spp.**

Populations of the Neotropics.
Entry into effect delayed by 12 months, i.e. until 28 August 2020.

79 ***Swietenia macrophylla***

Populations of the Neotropics

80 **ORCHIDACEAE spp.**

Included in Appendix II, except for the species included in Appendix I.
Additionally, artificially propagated hybrids of the following genera are not subject to the provisions of the Convention, if conditions, as indicated under a) and b), are met: *Cymbidium, Dendrobium, Phalaenopsis* and *Vanda*:
a) Specimens are readily recognizable as artificially propagated and do not show any signs of having been collected in the wild such as mechanical damage or strong dehydration resulting from collection, irregular growth and heterogeneous size and shape within a taxon and shipment, algae or other epiphyllous organisms adhering to leaves, or damage by insects or other pests; and
b) i) when shipped in non-flowering state, the specimens must be traded in shipments consisting of individual containers (such as cartons, boxes, crates or individual shelves of CC-containers) each containing 20 or more plants of the same hybrid; the plants within each container must exhibit a high degree of uniformity and healthiness; and the shipment must be accompanied by documentation, such as an invoice, which clearly states the number of plants of each hybrid; or
ii) when shipped in flowering state, with at least one fully open flower per specimen, no minimum number of specimens per shipment is required but specimens must be professionally processed for commercial retail sale, e.g. labelled with printed labels or packaged with printed packages indicating the name of the hybrid and the country of final processing. This should be clearly visible and allow easy verification.
Plants not clearly qualifying for the exemption must be accompanied by appropriate CITES documents.

81 ***Aerangis ellisii***

Included in Appendix I. Seedling or tissue cultures obtained *in vitro* and transported in sterile containers are not subject to the provisions of the Convention only if the specimens meet the definition of 'artificially propagated' agreed by the Conference of the Parties in Resolution Conf. 11.11 (Rev. CoP18), i.e. plant specimens: a) grown under controlled conditions; and b) grown from seeds, cuttings, divisions, callus tissues or other plant tissues, spores or other propagules that either are exempt from the provisions of the Convention or have been derived from cultivated parental stock.

82 ***Cattleya jongheana***

Included in Appendix I. Seedling or tissue cultures obtained *in vitro* and transported in sterile containers are not subject to the provisions of the Convention only if the specimens meet the definition of 'artificially propagated' agreed by the Conference of the Parties in Resolution Conf. 11.11 (Rev. CoP18), i.e. plant specimens: a) grown under controlled conditions; and b) grown from seeds, cuttings, divisions, callus tissues or other plant tissues, spores or other propagules that either are exempt from the provisions of the Convention or have been derived from cultivated parental stock.

83 ***Cattleya lobata***

Included in Appendix I. Seedling or tissue cultures obtained *in vitro* and transported in sterile containers are not subject to the provisions of the Convention only if the specimens meet the definition of 'artificially propagated' agreed by the Conference of the Parties in Resolution Conf. 11.11 (Rev. CoP18), i.e. plant specimens: a) grown under controlled conditions; and b) grown from seeds, cuttings, divisions, callus tissues or other plant tissues, spores or other propagules that either are exempt from the provisions of the Convention or have been derived from cultivated parental stock.

84 ***Dendrobium cruentum***

Included in Appendix I. Seedling or tissue cultures obtained *in vitro* and transported in sterile containers are not subject to the provisions of the Convention only if the specimens meet the definition of 'artificially propagated' agreed by the Conference of the Parties in Resolution Conf. 11.11 (Rev. CoP18), i.e. plant specimens: a) grown under controlled conditions; and b) grown from seeds, cuttings, divisions, callus tissues or other plant tissues, spores or other propagules that either are exempt from the provisions of the Convention or have been derived from cultivated parental stock.

85 ***Mexipedium xerophyticum***

Included in Appendix I. Seedling or tissue cultures obtained *in vitro* and transported in sterile containers are not subject to the provisions of the Convention only if the specimens meet the definition of 'artificially propagated' agreed by the Conference of the Parties in Resolution Conf. 11.11 (Rev. CoP18), i.e. plant specimens: a) grown under controlled conditions; and b) grown from seeds, cuttings, divisions, callus tissues or other plant tissues, spores or other propagules that either are exempt from the provisions of the Convention or have been derived from cultivated parental stock.

86 ***Paphiopedilum* spp.**

Included in Appendix I. Seedling or tissue cultures obtained *in vitro* and transported in sterile containers are not subject to the provisions of the Convention only if the specimens meet the definition of 'artificially propagated' agreed by the Conference of the Parties in Resolution Conf. 11.11 (Rev. CoP18), i.e. plant specimens: a) grown under controlled conditions; and b) grown from seeds, cuttings, divisions, callus tissues or other plant tissues, spores or other propagules that either are exempt from the provisions of the Convention or have been derived from cultivated parental stock.

87 ***Peristeria elata***

Included in Appendix I. Seedling or tissue cultures obtained *in vitro* and transported in sterile containers are not subject to the provisions of the Convention only if the specimens meet the definition of 'artificially propagated' agreed by the Conference of the Parties in Resolution Conf. 11.11 (Rev. CoP18), i.e. plant specimens: a) grown under controlled conditions; and b) grown from seeds, cuttings, divisions, callus tissues or other plant tissues, spores or other propagules that either are exempt from the provisions of the Convention or have been derived from cultivated parental stock.

88 ***Phragmipedium* spp.**

Included in Appendix I. Seedling or tissue cultures obtained *in vitro* and transported in sterile containers are not subject to the provisions of the Convention only if the specimens meet the definition of 'artificially propagated' agreed by the Conference of the Parties in Resolution Conf. 11.11 (Rev. CoP18), i.e. plant specimens: a) grown under controlled conditions; and b) grown from seeds, cuttings, divisions, callus tissues or other plant tissues, spores or other propagules that either are exempt from the provisions of the Convention or have been derived from cultivated parental stock.

89 ***Renanthera imschootiana***

Included in Appendix I. Seedling or tissue cultures obtained *in vitro* and transported in sterile containers are not subject to the provisions of the Convention only if the specimens meet the definition of 'artificially propagated' agreed by the Conference of the Parties in Resolution Conf. 11.11 (Rev. CoP18), i.e. plant specimens: a) grown under controlled conditions; and b) grown from seeds, cuttings, divisions, callus tissues or other plant tissues, spores or other propagules that either are exempt from the provisions of the Convention or have been derived from cultivated parental stock.

90 ***Cyclamen* spp.**

Artificially propagated specimens of cultivars of *Cyclamen persicum* are not subject to the provisions of the Convention. However, the exemption does not apply to such specimens traded as dormant tubers.

91 ***Osyris lanceolata***

Populations of Burundi, Ethiopia, Kenya, Rwanda, Uganda and the United Republic of Tanzania.

92 ***Picrorhiza kurrooa***

Excludes *Picrorhiza scrophulariiflora*.

93 ***Taxus chinensis***

Includes infraspecific taxa of this species

94 ***Taxus cuspidata***

Includes infraspecific taxa of this species. Artificially propagated hybrids and cultivars of *Taxus cuspidata*, live, in pots or other small containers, each consignment being accompanied by a label or document stating the name of the taxon or taxa and the text "artificially propagated", are not subject to the provisions of the Convention.

95 ***Taxus fuana***

Includes infraspecific taxa of this species.

96 ***Taxus sumatrana***

Includes infraspecific taxa of this species.

97 ***Siphonochilus aethiopicus***

Populations of Mozambique, South Africa, Eswatini and Zimbabwe.

Annotations preceded by ”#”

Annotations are used in the CITES Appendices to indicate which population, parts or derivatives are concerned by the listing or to clarify its scope. The meaning of the # annotations (applicable to flora only) has changed over the years. The # annotations that are currently valid are those adopted at the 16th Conference of the Parties (CoP 16). These are provided below.

CoP19	Valid from 23/02/2023
#1	All parts and derivatives, except: a) seeds, spores and pollen (including pollinia); b) seedling or tissue cultures obtained *in vitro* transported in sterile containers; c) cut flowers of artificially propagated plants; and d) fruits, and parts and derivatives thereof, of artificially propagated plants of the genus *Vanilla*
#2	All parts and derivatives except: a) seeds and pollen; and b) finished products packaged and ready for retail trade.
#3	Whole and sliced roots and parts of roots, excluding manufactured parts or derivatives, such as powders, pills, extracts, tonics, teas and confectionery.
#4	All parts and derivatives, except: a) seeds (including seedpods of Orchidaceae), spores and pollen (including pollinia). The exemption does not apply to seeds from Cactaceae spp. exported from Mexico, and to seeds from *Beccariophoenix madagascariensis* and *Dypsis decaryi* exported from Madagascar; b) seedling or tissue cultures obtained *in vitro* transported in sterile containers; c) cut flowers of artificially propagated plants; d) fruits, and parts and derivatives thereof, of naturalized or artificially propagated plants of the genus *Vanilla* (Orchidaceae) and of the family Cactaceae; e) stems, flowers, and parts and derivatives thereof, of naturalized or artificially propagated plants of the genera *Opuntia* subgenus *Opuntia* and *Selenicereus* (Cactaceae); f) finished products of *Aloe ferox* and *Euphorbia antisyphilitica* packaged and ready for retail trade; and g) finished products derived from artificial propagation, packaged and ready for retail trade of cosmetics containing parts and derivatives of *Bletilla striata*, *Cycnoches cooperi*, *Gastrodia elata*, *Phalaenopsis amabilis* or *Phalaenopsis lobbii*.
#5	Logs, sawn wood and veneer sheets.
#6	Logs, sawn wood, veneer sheets and plywood.
#7	Logs, woodchips, powder and extracts.
#8	Underground parts (i.e. roots, rhizomes): whole, parts and powdered.
#9	All parts and derivatives except those bearing a label: “Produced from *Hoodia* spp. material obtained through controlled harvesting and production under the terms of an agreement with the relevant CITES Management Authority of [Botswana under agreement No. BW/xxxxxx] [Namibia under agreement No. NA/xxxxxx] [South Africa under agreement No. ZA/xxxxxx]”.
#10	All parts, derivatives and finished products, except re-export of finished musical instruments, finished musical instrument accessories and finished musical instrument parts.
#11	Logs, sawn wood, veneer sheets, plywood, powder and extracts. Finished products containing such extracts as ingredients, including fragrances, are not considered to be covered by this annotation.
#12	Logs, sawn wood, veneer sheets, plywood and extracts. Finished products containing such extracts as ingredients, including fragrances, are not considered to be covered by this annotation.
#13	The kernel (also known as ’endosperm’, ’pulp’ or ’copra’) and any derivatives thereof, except finished products packaged and ready for retail trade.
#14	All parts and derivatives except: a) seeds and pollen; b) seedling or tissue cultures obtained *in vitro* transported in sterile containers; c) fruits; d) leaves; e) exhausted agarwood powder, including compressed powder in all shapes; and f) finished products packaged and ready for retail trade, this exemption does not apply to wood chips, beads, prayer beads and carvings.

#15 All parts and derivatives, except:
a) Leaves, flowers, pollen, fruits, and seeds;
b) Finished products to a maximum weight of wood of the listed species of up to 10 kg per shipment;
c) Finished musical instruments, finished musical instrument parts and finished musical instrument accessories;
d) Parts and derivatives of *Dalbergia cochinchinensis*, which are covered by Annotation # 4; and
e) Parts and derivatives of *Dalbergia* spp. originating and exported from Mexico, which are covered by Annotation # 6.

#16 Seeds, fruits and oils.

#17 Logs, sawn wood, veneer sheets, plywood and transformed wood.

#18 Excluding parts and derivatives, other than eggs

Appendix D

International Union for the Conservation of Nature Red List

IUCN Red List for The Bahamas Species Observed at Calypso Cove Site during Field Assessements for EIA Highlighted

Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Anodontites trigonus	Data Deficient			
Brachiaria mutica	Least Concern			
Cladium mariscus	Least Concern			
Cyperus compressus	Least Concern			
Cyperus polystachyos	Least Concern			
Cyperus squarrosus	Least Concern			
Cyprinodon brontotheroides	Least Concern			
Cyprinodon desquamator	Least Concern			
Cyprinodon laciniatus	Endangered			
Drepanotrema cimex	Least Concern			
Eupera cubensis	Least Concern			
Galba cubensis	Least Concern			
Gambusia puncticulata	Least Concern			
Laterallus jamaicensis	Endangered			
Ludwigia octovalvis	Least Concern			
Najas marina	Least Concern			
Paspalidium geminatum	Least Concern			
Persicaria glabrum	Least Concern			
Potamogeton nodosus	Least Concern			
Somersiella sterreri	Critically Endangered			
Utricularia foliosa	Least Concern			
Utricularia gibba	Least Concern			
Achirus lineatus	Least Concern			
Angiola lineata	Least Concern			
Anguilla rostrata	Endangered			
Bairdiella chrysoura	Least Concern			
Bathygobius soporator	Least Concern			
Caranx hippos	Least Concern			
Caranx latus	Least Concern			
Carcharhinus leucas	Vulnerable			
Centropomus parallelus	Least Concern			
Charadrius melodus	Near Threatened			
Chriodorus atherinoides	Least Concern			
Colomesus psittacus	Least Concern			
Ctenogobius boleosoma	Least Concern			
Ctenogobius stigmaturus	Least Concern			
Dajaus monticola	Least Concern			
Dormitator maculatus	Least Concern			
Eleotris perniger	Least Concern			
Erotelis smaragdus	Least Concern			
Eucinostomus argenteus	Least Concern			
Eucinostomus gula	Least Concern			
Eucinostomus harengulus	Least Concern			

IUCN Red List for The Bahamas Species Observed at Calypso Cove Site during Field Assessements for EIA Highlighted

Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Eucinostomus havana	Least Concern			
Eucinostomus melanopterus	Least Concern			
Floridichthys carpio	Least Concern			
Fundulus grandis	Least Concern			
Gambusia manni	Least Concern			
Gerres cinereus	Least Concern			
Gobiomorus dormitor	Least Concern			
Joturus pichardi	Least Concern			
Kryptolebias marmoratus	Least Concern			
Littoraria angulifera	Least Concern			
Lophogobius cyprinoides	Least Concern			
Lucifuga lucayana	Endangered			
Lucifuga spelaeotes	Vulnerable			
Megalops atlanticus	Vulnerable			
Melampus coffeus	Least Concern			
Microphis brachyurus	Least Concern			
Mugil curema	Least Concern			
Mugil liza	Data Deficient			
Mugil trichodon	Least Concern			
Rhonciscus crocro	Data Deficient			
Sicydium plumieri	Data Deficient			
Trichechus manatus	Vulnerable			
Vitta virginea	Least Concern			
Ablennes hians	Least Concern			
Abralia redfieldi	Least Concern			
Abudefduf saxatilis	Least Concern	Sergeant Major		✓
Abudefduf taurus	Least Concern			
Abyssobrotula galatheae	Least Concern			
Acanthacaris caeca	Least Concern			
Acanthemblemaria aspera	Least Concern			
Acanthemblemaria chaplini	Least Concern			
Acanthemblemaria maria	Least Concern			
Acanthemblemaria paula	Data Deficient			
Acanthemblemaria spinosa	Least Concern			
Acanthochaenus luetkenii	Least Concern			
Acanthocybium solandri	Least Concern			
Acanthonus armatus	Least Concern			
Acanthostracion polygonius	Least Concern	Honeycomb Cowfish		✓
Acanthostracion quadricornis	Least Concern			
Acanthurus chirurgus	Least Concern	Doctorfish		✓
Acanthurus coeruleus	Least Concern	Blue Tang		✓
Acanthurus tractus	Least Concern			

IUCN Red List for The Bahamas Species Observed at Calypso Cove Site during Field Assessements for EIA Highlighted

Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Acentronura dendritica	Least Concern			
Acromycter atlanticus	Least Concern			
Acromycter perturbator	Least Concern			
Acropora cervicornis	Critically Endangered			
Acropora palmata	Critically Endangered			
Actinopyga agassizi	Least Concern			
Acyrtops beryllinus	Least Concern			
Acyrtus artius	Least Concern			
Acyrtus lanthanum	Least Concern			
Acyrtus rubiginosus	Least Concern			
Aetobatus narinari	Endangered			
Agaricia agaricites	Vulnerable	Lettuce Coral		✓
Agaricia fragilis	Least Concern			
Agaricia grahamae	Near Threatened			
Agaricia humilis	Critically Endangered			
Agaricia lamarcki	Critically Endangered			
Agaricia tenuifolia	Critically Endangered			
Agaricia undata	Least Concern			
Ahlia egmontis	Least Concern			
Ahliesaurus berryi	Least Concern			
Aldrovandia affinis	Least Concern			
Aldrovandia gracilis	Least Concern			
Aldrovandia oleosa	Least Concern			
Aldrovandia phalacra	Least Concern			
Aldrovandia rostrata	Least Concern			
Alectis ciliaris	Least Concern			
Alepisaurus brevirostris	Least Concern			
Alepisaurus ferox	Least Concern			
Alepocephalus agassizii	Least Concern			
Alepocephalus australis	Least Concern			
Alepocephalus productus	Least Concern			
Alopias superciliosus	Vulnerable			
Alopias vulpinus	Vulnerable			
Alphestes afer	Least Concern			
Aluterus heudelotii	Least Concern			
Aluterus monoceros	Least Concern			
Aluterus schoepfii	Least Concern			
Aluterus scriptus	Least Concern			
Amblycirrhitus pinos	Least Concern			
Amphigymnas bahamensis	Least Concern			
Anarchias similis	Least Concern			
Anarchopterus criniger	Least Concern			
Anarchopterus tectus	Least Concern			

IUCN Red List for The Bahamas Species Observed at Calypso Cove Site during
Field Assessements for EIA Highlighted

Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Anchoa cayorum	Least Concern			
Anchoa lamprotaenia	Least Concern			
Ancylopsetta antillarum	Least Concern			
Ancylopsetta cycloidea	Least Concern			
Anisotremus surinamensis	Data Deficient	Black Margate		✓
Anisotremus virginicus	Least Concern	Porkfish		✓
Anoplogaster brachycera	Data Deficient			
Anoplogaster cornuta	Least Concern			
Antennarius multiocellatus	Least Concern			
Antennarius pauciradiatus	Least Concern			
Antennarius striatus	Least Concern			
Antennatus bermudensis	Least Concern			
Antigonia capros	Least Concern			
Antigonia combatia	Least Concern			
Antilligobius nikkiae	Least Concern			
Antimora rostrata	Least Concern			
Apagesoma delosommatus	Least Concern			
Apagesoma edentatum	Least Concern			
Aphyonus gelatinosus	Least Concern			
Apogon aurolineatus	Least Concern			
Apogon binotatus	Least Concern			
Apogon gouldi	Least Concern			
Apogon lachneri	Least Concern			
Apogon leptocaulus	Least Concern			
Apogon maculatus	Least Concern			
Apogon mosavi	Least Concern			
Apogon phenax	Least Concern			
Apogon pillionatus	Least Concern			
Apogon planifrons	Least Concern			
Apogon pseudomaculatus	Least Concern			
Apogon quadrisquamatus	Least Concern			
Apogon robinsi	Least Concern			
Apogon townsendi	Least Concern			
Aprognathodon platyventris	Least Concern			
Apsilus dentatus	Least Concern			
Apterichtus ansp	Least Concern			
Apterichtus kendalli	Least Concern			
Arcos nudus	Least Concern			
Arctides guineensis	Least Concern			
Arctozenus risso	Least Concern			
Argentina georgei	Least Concern			
Argonauta argo	Least Concern			
Argonauta hians	Least Concern			

IUCN Red List for The Bahamas Species Observed at Calypso Cove Site during Field Assessements for EIA Highlighted

Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Argyripnus atlanticus	Least Concern			
Argyropelecus aculeatus	Least Concern			
Argyropelecus affinis	Least Concern			
Argyropelecus gigas	Least Concern			
Argyropelecus olfersii	Least Concern			
Argyropelecus sladeni	Least Concern			
Ariomma melanum	Least Concern			
Ariopsis felis	Least Concern			
Ariosoma anale	Least Concern			
Ariosoma balearicum	Least Concern			
Ariosoma selenops	Least Concern			
Aristostomias grimaldii	Least Concern			
Aristostomias lunifer	Least Concern			
Aristostomias polydactylus	Least Concern			
Aristostomias tittmanni	Least Concern			
Aristostomias xenostoma	Least Concern			
Asquamiceps caeruleus	Least Concern			
Astichopus multifidus	Least Concern			
Astrapogon alutus	Least Concern			
Astrapogon puncticulatus	Least Concern			
Astrapogon stellatus	Data Deficient			
Astronesthes atlanticus	Least Concern			
Astronesthes gemmifer	Data Deficient			
Astronesthes gudrunae	Least Concern			
Astronesthes indicus	Least Concern			
Astronesthes leucopogon	Least Concern			
Astronesthes macropogon	Least Concern			
Astronesthes micropogon	Least Concern			
Astronesthes niger	Least Concern			
Astronesthes richardsoni	Least Concern			
Astronesthes similus	Least Concern			
Astronesthes zharovi	Least Concern			
Astroscopus guttatus	Least Concern			
Ataxolepis apus	Least Concern			
Atherinomorus stipes	Least Concern			
Atractodenchelys phrix	Least Concern			
Aulopus filamentosus	Least Concern			
Aulostomus maculatus	Least Concern			
Austrorossia antillensis	Least Concern			
Auxis rochei	Least Concern			
Auxis thazard	Least Concern			
Avocettina infans	Least Concern			
Bagre marinus	Least Concern			

IUCN Red List for The Bahamas Species Observed at Calypso Cove Site during
Field Assessements for EIA Highlighted

Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Bajacalifornia megalops	Least Concern			
Balaenoptera acutorostrata	Least Concern			
Balaenoptera borealis	Endangered			
Balaenoptera edeni	Least Concern			
Baldwinella vivanus	Least Concern			
Balistes capriscus	Vulnerable			
Balistes vetula	Near Threatened	Queen Triggerfish		✓
Barathrites iris	Least Concern			
Barathrites parri	Least Concern			
Barathrodemus manatinus	Least Concern			
Barathronus bicolor	Least Concern			
Barbourisia rufa	Least Concern			
Barbulifer antennatus	Least Concern			
Barbulifer ceuthoecus	Least Concern			
Bassogigas gillii	Least Concern			
Bassozetus compressus	Least Concern			
Bassozetus levistomatus	Least Concern			
Bassozetus nielseni	Least Concern			
Bassozetus normalis	Least Concern			
Bassozetus robustus	Least Concern			
Bassozetus taenia	Least Concern			
Bathophilus brevis	Least Concern			
Bathophilus digitatus	Least Concern			
Bathophilus longipes	Least Concern			
Bathophilus longipinnis	Least Concern			
Bathophilus metallicus	Least Concern			
Bathophilus nigerrimus	Least Concern			
Bathophilus pawneei	Least Concern			
Bathophilus schizochirus	Least Concern			
Bathophilus vaillanti	Least Concern			
Bathyanthias cubensis	Least Concern			
Bathyarctus faxoni	Least Concern			
Bathyclupea schroederi	Least Concern			
Bathycongrus dubius	Least Concern			
Bathycongrus polyporus	Least Concern			
Bathycongrus thysanochilus	Least Concern			
Bathycongrus vicinalis	Least Concern			
Bathygadus melanobranchus	Least Concern			
Bathygobius antilliensis	Least Concern			
Bathygobius curacao	Least Concern			
Bathygobius lacertus	Least Concern			
Bathygobius mystacium	Least Concern			
Bathylaco nigricans	Least Concern			

IUCN Red List for The Bahamas Species Observed at Calypso Cove Site during
Field Assessements for EIA Highlighted

Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Bathylagichthys greyae	Least Concern			
Bathylychnops brachyrhynchus	Data Deficient			
Bathyonus laticeps	Data Deficient			
Bathyplotes natans	Least Concern			
Bathyplotes pourtalesii	Least Concern			
Bathyprion danae	Least Concern			
Bathypterois bigelowi	Least Concern			
Bathypterois grallator	Least Concern			
Bathypterois phenax	Least Concern			
Bathypterois viridensis	Least Concern			
Bathysaurus mollis	Least Concern			
Bathyteuthis abyssicola	Least Concern			
Bathytoshia centroura	Vulnerable			
Bathytroctes macrolepis	Least Concern			
Bathytroctes michaelsarsi	Least Concern			
Bathytroctes microlepis	Least Concern			
Bathytroctes squamosus	Least Concern			
Bathytyphlops marionae	Least Concern			
Bathyuroconger vicinus	Least Concern			
Bellator brachychir	Least Concern			
Bellator egretta	Least Concern			
Bellator militaris	Least Concern			
Bembrops gobioides	Least Concern			
Bembrops macromma	Least Concern			
Benthalbella infans	Least Concern			
Benthobatis marcida	Least Concern			
Benthocometes robustus	Least Concern			
Benthodesmus tenuis	Least Concern			
Benthosema suborbitale	Least Concern			
Beryx decadactylus	Least Concern			
Beryx splendens	Least Concern			
Bodianus pulchellus	Least Concern			
Bodianus rufus	Least Concern	Spanish Hogfish		✓
Bolinichthys indicus	Least Concern			
Bolinichthys photothorax	Least Concern			
Bolinichthys supralateralis	Least Concern			
Bolitaena pygmaea	Least Concern			
Bonapartia pedaliota	Least Concern			
Borostomias elucens	Least Concern			
Borostomias mononema	Least Concern			
Bothus lunatus	Least Concern	Peacock Flounder		✓
Bothus maculiferus	Least Concern			
Bothus ocellatus	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Bothus robinsi	Least Concern			
Brachioteuthis riisei	Data Deficient			
Brama brama	Least Concern			
Brama caribbea	Least Concern			
Brama dussumieri	Least Concern			
Bregmaceros atlanticus	Least Concern			
Bregmaceros cantori	Least Concern			
Bregmaceros nectabanus	Least Concern			
Breviraja colesi	Least Concern			
Brevoortia patronus	Least Concern			
Brinkmannella elongata	Data Deficient			
Brockius albigenys	Least Concern			
Brockius nigricinctus	Least Concern			
Brotulotaenia brevicauda	Least Concern			
Brotulotaenia crassa	Least Concern			
Brotulotaenia nigra	Least Concern			
Bryx dunckeri	Least Concern			
Bufoceratias wedli	Least Concern			
Bullisichthys caribbaeus	Least Concern			
Bythites gerdae	Least Concern			
Calamopteryx goslinei	Least Concern			
Calamopteryx robinsorum	Least Concern			
Calamus bajonado	Least Concern			
Calamus calamus	Least Concern			
Calamus sp	Least Concern	Porgy		✓
Calamus penna	Least Concern			
Calamus pennatula	Least Concern			
Callechelys bilinearis	Least Concern			
Callechelys guineensis	Least Concern			
Callechelys muraena	Least Concern			
Callionymus bairdi	Least Concern			
Cantherhines macrocerus	Least Concern			
Cantherhines pullus	Least Concern	Orangespotted Filefish		✓
Canthidermis maculata	Least Concern			
Canthidermis sufflamen	Least Concern	Ocean Triggerfish		✓
Canthigaster jamestyleri	Least Concern			
Canthigaster rostrata	Least Concern	Sharpnose Puffer		✓
Caralophia loxochila	Least Concern			
Caranx bartholomaei	Least Concern	Yellow Jack		✓
Caranx crysos	Least Concern			
Caranx lugubris	Least Concern			
Caranx ruber	Least Concern	Bar Jack		✓
Carapus bermudensis	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Carcharhinus acronotus	Endangered			
Carcharhinus altimus	Near Threatened			
Carcharhinus brevipinna	Vulnerable			
Carcharhinus falciformis	Vulnerable			
Carcharhinus limbatus	Vulnerable			
Carcharhinus longimanus	Critically Endangered			
Carcharhinus obscurus	Endangered			
Carcharhinus perezi	Endangered			
Carcharhinus plumbeus	Endangered			
Carcharias taurus	Critically Endangered			
Carcharodon carcharias	Vulnerable			
Cardus crucifer	Least Concern			
Cataetyx laticeps	Least Concern			
Catesbya pseudomuraena	Data Deficient			
Caulolatilus chrysops	Least Concern			
Caulolatilus dooleyi	Data Deficient			
Caulolatilus williamsi	Data Deficient			
Caulophryne jordani	Least Concern			
Caulophryne polynema	Least Concern			
Centrobranchus nigroocellatus	Least Concern			
Centrodraco acanthopoma	Least Concern			
Centrophryne spinulosa	Least Concern			
Centropyge argi	Least Concern			
Centropyge aurantonotus	Least Concern			
Centroscymnus coelolepis	Near Threatened			
Centroscymnus owstonii	Vulnerable			
Cephalopholis cruentata	Least Concern			
Cephalopholis fulva	Least Concern			
Cephalopholis furcifer	Least Concern			
Ceratias holboelli	Least Concern			
Ceratias uranoscopus	Least Concern			
Ceratoscopelus maderensis	Least Concern			
Ceratoscopelus townsendi	Least Concern			
Ceratoscopelus warmingii	Least Concern			
Cerdale floridana	Least Concern			
Cetomimus gillii	Data Deficient			
Cetomimus kerdops	Data Deficient			
Cetomimus teevani	Least Concern			
Cetorhinus maximus	Endangered			
Cetostoma regani	Data Deficient			
Chaenophryne draco	Least Concern			
Chaenophryne longiceps	Least Concern			
Chaenophryne ramifera	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Chaenopsis limbaughi	Least Concern			
Chaenopsis ocellata	Least Concern			
Chaetodipterus faber	Least Concern			
Chaetodon capristatus	Least Concern	Foureye Butterflyfish		✓
Chaetodon ocellatus	Least Concern	Spotfin Butterflyfish		✓
Chaetodon sedentarius	Least Concern			
Chaetodon striatus	Least Concern	Banded Butterflyfish		✓
Channomuraena vittata	Least Concern			
Chascanopsetta danae	Least Concern			
Chascanopsetta lugubris	Least Concern			
Chauliodus danae	Least Concern			
Chauliodus sloani	Least Concern			
Chaunacops roseus	Least Concern			
Chaunax pictus	Least Concern			
Chaunax suttkusi	Least Concern			
Cheilopogon cyanopterus	Least Concern			
Cheilopogon exsiliens	Least Concern			
Cheilopogon furcatus	Least Concern			
Cheilopogon melanurus	Least Concern			
Cheilopogon nigricans	Least Concern			
Chiasmodon niger	Least Concern			
Chiasmodon pluriradiatus	Least Concern			
Chilomycterus antennatus	Least Concern			
Chilomycterus antillarum	Least Concern			
Chilomycterus reticulatus	Least Concern			
Chilomycterus schoepfii	Least Concern			
Chilorhinus suensonii	Least Concern			
Chimaera bahamaensis	Least Concern			
Chimaera cubana	Least Concern			
Chirostomias pliopterus	Least Concern			
Chlopsis bicolor	Least Concern			
Chlopsis dentatus	Data Deficient			
Chlorophthalmus agassizi	Least Concern			
Chloroscombrus chrysurus	Least Concern			
Choranthias tenuis	Least Concern			
Chriolepis bilix	Least Concern			
Chriolepis fisheri	Least Concern			
Chrionema squamentum	Least Concern			
Chromis cyanea	Least Concern	Blue Chromis		✓
Chromis enchrysura	Least Concern			
Chromis insolata	Least Concern			
Chromis multilineata	Least Concern			
Chromis scotti	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Citharichthys cornutus	Least Concern			
Citharichthys gymnorhinus	Least Concern			
Citharichthys macrops	Least Concern			
Cladocora arbuscula	Least Concern			
Clepticus parrae	Least Concern			
Coccorella atlantica	Least Concern			
Coelorinchus occa	Least Concern			
Coelorinchus ventrilux	Least Concern			
Coloconger meadi	Least Concern			
Colpophyllia breviserialis	Critically Endangered			
Colpophyllia natans	Vulnerable	Boulder Brain Coral	✓	
Conger esculentus	Least Concern			
Conger oceanicus	Least Concern			
Conger triporiceps	Least Concern			
Conocara macropterum	Least Concern			
Conodon nobilis	Least Concern			
Conus acutimarginatus	Least Concern			
Conus arangoi	Least Concern			
Conus attenuatus	Least Concern			
Conus bahamensis	Least Concern			
Conus branhamae	Least Concern			
Conus caysalensis	Least Concern			
Conus centurio	Least Concern			
Conus daucus	Least Concern			
Conus flavescens	Least Concern			
Conus granulatus	Least Concern			
Conus jucundus	Least Concern			
Conus leekremeri	Data Deficient			
Conus lindae	Least Concern			
Conus pacei	Least Concern			
Conus patae	Least Concern			
Conus richardbinghami	Vulnerable			
Conus sahlbergi	Least Concern			
Conus spurius	Least Concern			
Conus villepinii	Least Concern			
Conus zylmanae	Least Concern			
Cookeolus japonicus	Least Concern			
Coralliozetus cardonae	Least Concern			
Corniger spinosus	Least Concern			
Corvula batabana	Least Concern			
Corvula sanctaeluciae	Least Concern			
Coryphaena equiselis	Least Concern			
Coryphaena hippurus	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Coryphaenoides armatus	Least Concern			
Coryphaenoides rudis	Least Concern			
Coryphaenoides rupestris	Critically Endangered			
Coryphopterus alloides	Vulnerable			
Coryphopterus dicrus	Least Concern			
Coryphopterus eidolon	Vulnerable			
Coryphopterus glaucofraenum	Least Concern			
Coryphopterus hyalinus	Vulnerable			
Coryphopterus kuna	Data Deficient			
Coryphopterus lipernes	Vulnerable			
Coryphopterus personatus	Vulnerable			
Coryphopterus punctipectophorus	Least Concern			
Coryphopterus thrix	Vulnerable			
Coryphopterus tortugae	Vulnerable			
Coryphopterus venezuelae	Vulnerable			
Cosmocampus albirostris	Least Concern			
Cosmocampus brachycephalus	Least Concern			
Cosmocampus elucens	Least Concern			
Cosmocampus hildebrandi	Least Concern			
Cruriraja atlantis	Least Concern			
Cruriraja poeyi	Least Concern			
Cruriraja rugosa	Least Concern			
Cryptopsaras couesii	Least Concern			
Cryptotomus roseus	Least Concern			
Ctenogobius saepepallens	Least Concern			
Cubiceps caeruleus	Least Concern			
Cubiceps capensis	Least Concern			
Cubiceps pauciradiatus	Least Concern			
Cyclothone acclinidens	Least Concern			
Cyclothone alba	Least Concern			
Cyclothone braueri	Least Concern			
Cyclothone microdon	Least Concern			
Cyclothone obscura	Least Concern			
Cyclothone pallida	Least Concern			
Cyclothone parapallida	Least Concern			
Cyclothone pseudopallida	Least Concern			
Cyema atrum	Least Concern			
Cynoscion nebulosus	Least Concern			
Cynoscion nothus	Least Concern			
Cynoscion regalis	Endangered			
Cypselurus comatus	Least Concern			
Cyttopsis rosea	Least Concern			
Dactylopterus volitans	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Dactyloscopus boehlkei	Least Concern			
Dactyloscopus comptus	Least Concern			
Dactyloscopus crossotus	Least Concern			
Dactyloscopus foraminosus	Least Concern			
Dactyloscopus moorei	Least Concern			
Dactyloscopus poeyi	Least Concern			
Dactyloscopus tridigitatus	Least Concern			
Danacetichthys galathenus	Data Deficient			
Danaphryne nigrifilis	Least Concern			
Decapterus macarellus	Least Concern			
Decapterus punctatus	Least Concern			
Decapterus tabl	Least Concern			
Decodon puellaris	Least Concern			
Delphinus delphis	Least Concern			
Dendrogyra cylindrus	Critically Endangered	Pillar Coral		✓
Derilissus lombardii	Data Deficient			
Derilissus nanus	Data Deficient			
Dermatolepis inermis	Data Deficient			
Desmodema polystictum	Least Concern			
Diaphus adenomus	Least Concern			
Diaphus bertelseni	Least Concern			
Diaphus brachycephalus	Least Concern			
Diaphus dumerilii	Data Deficient			
Diaphus effulgens	Least Concern			
Diaphus fragilis	Least Concern			
Diaphus garmani	Least Concern			
Diaphus lucidus	Least Concern			
Diaphus luetkeni	Least Concern			
Diaphus metopoclampus	Least Concern			
Diaphus minax	Least Concern			
Diaphus mollis	Least Concern			
Diaphus perspicillatus	Least Concern			
Diaphus problematicus	Least Concern			
Diaphus roei	Least Concern			
Diaphus splendidus	Least Concern			
Diaphus subtilis	Data Deficient			
Diaphus taaningi	Data Deficient			
Diaphus termophilus	Least Concern			
Dibranchus atlanticus	Least Concern			
Dibranchus tremendus	Least Concern			
Diceratias pileatus	Least Concern			
Dichocoenia stokesii	Vulnerable	Elliptical Star Coral	✓	
Dicrolene intronïger	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Dicrolene kanazawai	Least Concern			
Diodon holocanthus	Least Concern			
Diodon hystrix	Least Concern			
Diogenichthys atlanticus	Least Concern			
Diplectrum formosum	Least Concern			
Diplodus argenteus	Least Concern			
Diplogrammus pauciradiatus	Least Concern			
Diplophos taenia	Least Concern			
Diploria labyrinthiformis	Critically Endangered	Grooved Brain Coral	✓	
Diplospinus multistriatus	Least Concern			
Dipturus teevani	Least Concern			
Diretmichthys parini	Least Concern			
Diretmoides pauciradiatus	Least Concern			
Diretmus argenteus	Least Concern			
Ditropichthys storeri	Data Deficient			
Dolicholagus longirostris	Least Concern			
Dolichopteroides binocularis	Least Concern			
Dolichopteryx longipes	Least Concern			
Dolopichthys allector	Least Concern			
Dolopichthys longicornis	Least Concern			
Dolopichthys pullatus	Data Deficient			
Doratonotus megalepis	Least Concern			
Doryteuthis plei	Least Concern			
Doryteuthis roperi	Data Deficient			
Dysalotus alcocki	Least Concern			
Dysalotus oligoscolus	Least Concern			
Dysomma anguillare	Least Concern			
Dysomma brevirostre	Least Concern			
Dysommina rugosa	Least Concern			
Echeneis naucrates	Least Concern			
Echeneis neucratoides	Data Deficient			
Echidna catenata	Least Concern			
Echiostoma barbatum	Least Concern			
Einara macrolepis	Least Concern			
Elacatinus atronasus	Endangered			
Elacatinus chancei	Least Concern			
Elacatinus evelynae	Least Concern			
Elacatinus genie	Least Concern			
Elacatinus horsti	Least Concern			
Elacatinus louisae	Least Concern			
Elagatis bipinnulata	Least Concern			
Elops saurus	Least Concern			
Elops smithi	Data Deficient			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Emblemaria atlantica	Least Concern			
Emblemaria caldwelli	Least Concern			
Emblemaria pandionis	Least Concern			
Emblemariopsis bahamensis	Least Concern			
Emblemariopsis leptocirris	Least Concern			
Emblemariopsis occidentalis	Least Concern			
Emblemariopsis signifer	Least Concern			
Emmelichthyops atlanticus	Least Concern			
Emmelichthys ruber	Least Concern			
Enchelycore carychroa	Least Concern			
Enchelycore nigricans	Least Concern			
Enchelyopus cimbrius	Least Concern			
Engyophrys senta	Least Concern			
Enneanectes altivelis	Least Concern			
Enneanectes atrorus	Least Concern			
Enneanectes boehlkei	Least Concern			
Enneanectes jordani	Least Concern			
Enneanectes pectoralis	Least Concern			
Enneanectes quadra	Least Concern			
Enoplometopus antillensis	Least Concern			
Entomacrodus nigricans	Least Concern			
Epigonus denticulatus	Least Concern			
Epigonus macrops	Least Concern			
Epigonus occidentalis	Least Concern			
Epigonus pandionis	Least Concern			
Epinephelus adscensionis	Least Concern			
Epinephelus guttatus	Least Concern	Red Hind		✓
Epinephelus itajara	Vulnerable			
Epinephelus striatus	Critically Endangered	Nassau Grouper		✓
Epinnula magistralis	Least Concern			
Equetus lanceolatus	Least Concern			
Equetus punctatus	Least Concern			
Eridacnis barbouri	Least Concern			
Erythrocles monodi	Least Concern			
Etelis oculatus	Data Deficient			
Etmopterus hillianus	Least Concern			
Etmopterus virens	Least Concern			
Euaxoctopus pillsburyae	Data Deficient			
Eucinostomus jonesii	Least Concern			
Eucinostomus lefroyi	Least Concern			
Euleptorhamphus velox	Least Concern			
Eumecichthys fiski	Least Concern			
Eumegistus brevorti	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Eunephrops cadenasi	Least Concern			
Eunephrops manningi	Data Deficient			
Eurypharynx pelecanoides	Least Concern			
Eusmilia fastigiata	Critically Endangered	Smooth Flower Coral		✓
Eustomias achirus	Least Concern			
Eustomias acinosus	Data Deficient			
Eustomias arborifer	Least Concern			
Eustomias bibulbosus	Least Concern			
Eustomias bigelowi	Least Concern			
Eustomias bimargaritatus	Least Concern			
Eustomias binghami	Least Concern			
Eustomias bituberatus	Least Concern			
Eustomias braueri	Data Deficient			
Eustomias brevibarbatus	Least Concern			
Eustomias contiguus	Data Deficient			
Eustomias dendriticus	Least Concern			
Eustomias dubius	Least Concern			
Eustomias enbarbatus	Least Concern			
Eustomias filifer	Least Concern			
Eustomias fissibarbis	Least Concern			
Eustomias furcifer	Least Concern			
Eustomias hulleyi	Least Concern			
Eustomias kreffti	Least Concern			
Eustomias lipochirus	Least Concern			
Eustomias longibarba	Least Concern			
Eustomias macronema	Least Concern			
Eustomias macrophthalmus	Least Concern			
Eustomias macrurus	Least Concern			
Eustomias melanostigma	Least Concern			
Eustomias micraster	Least Concern			
Eustomias micropterygius	Data Deficient			
Eustomias monoclonus	Least Concern			
Eustomias obscurus	Least Concern			
Eustomias parri	Least Concern			
Eustomias patulus	Data Deficient			
Eustomias paucifilis	Least Concern			
Eustomias polyaster	Data Deficient			
Eustomias satterleei	Least Concern			
Eustomias schmidti	Least Concern			
Eustomias simplex	Least Concern			
Eustomias tenisoni	Data Deficient			
Eustomias variabilis	Least Concern			
Eutaeniophorus festivus	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Euthynnus alletteratus	Least Concern			
Evermannella indica	Least Concern			
Evermannichthys convictor	Data Deficient			
Evermannichthys metzelaari	Least Concern			
Evermannichthys silus	Data Deficient			
Evermannichthys spongicola	Least Concern			
Evoxymetopon taeniatus	Least Concern			
Exocoetus obtusirostris	Least Concern			
Exocoetus volitans	Least Concern			
Favia fragum	Least Concern	Golfball Coral	✓	
Fenestraja atripinna	Least Concern			
Fenestraja cubensis	Least Concern			
Fenestraja ishiyamai	Least Concern			
Fenestraja sinusmexicanus	Least Concern			
Feresa attenuata	Least Concern			
Fistularia petimba	Least Concern			
Fistularia tabacaria	Least Concern			
Flagellostomias boureei	Least Concern			
Foetorepus agassizii	Least Concern			
Fowlerichthys radiosus	Least Concern			
Fundulus similis	Least Concern			
Gadella imberbis	Least Concern			
Gadomus arcuatus	Least Concern			
Gadomus longifilis	Least Concern			
Gastropsetta frontalis	Least Concern			
Gempylus serpens	Least Concern			
Gephyroberyx darwinii	Least Concern			
Gibberichthys pumilus	Least Concern			
Gigantactis longicirra	Least Concern			
Gigantactis vanhoeffeni	Data Deficient			
Gigantura chuni	Least Concern			
Gigantura indica	Least Concern			
Gillellus greyae	Least Concern			
Gillellus healae	Least Concern			
Gillellus uranidea	Least Concern			
Ginglymostoma cirratum	Vulnerable			
Ginsburgellus novemlineatus	Least Concern			
Globicephala macrorhynchus	Least Concern			
Gnatholepis thompsoni	Least Concern			
Gnathophis bathytopos	Least Concern			
Gnathophis tritos	Least Concern			
Gobiesox lucayanus	Least Concern			
Gobiesox punctulatus	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Gobioclinus bucciferus	Least Concern			
Gobioclinus filamentosus	Least Concern			
Gobioclinus gobio	Least Concern			
Gobioclinus guppyi	Least Concern			
Gobioclinus haitiensis	Least Concern			
Gobioclinus kalisherae	Least Concern			
Gobiosoma grosvenori	Least Concern			
Gobulus myersi	Least Concern			
Gonichthys cocco	Least Concern			
Gonioplectrus hispanus	Least Concern			
Gonostoma atlanticum	Least Concern			
Gonostoma denudatum	Least Concern			
Gonostoma elongatum	Least Concern			
Gordiichthys irretitus	Least Concern			
Gramma linki	Least Concern			
Gramma loreto	Least Concern			
Gramma melacara	Least Concern			
Grammatostomias circularis	Least Concern			
Grammatostomias dentatus	Least Concern			
Grammatostomias flagellibarba	Least Concern			
Grammicolepis brachiusculus	Least Concern			
Grammonus claudei	Least Concern			
Grampus griseus	Least Concern			
Gymnachirus melas	Least Concern			
Gymnothorax conspersus	Least Concern			
Gymnothorax funebris	Least Concern			
Gymnothorax hubbsi	Least Concern			
Gymnothorax miliaris	Least Concern			
Gymnothorax moringa	Least Concern			
Gymnothorax nigromarginatus	Least Concern			
Gymnothorax polygonius	Least Concern			
Gymnothorax vicinus	Least Concern			
Gymnura lessae	Least Concern			
Gyrinomimus myersi	Data Deficient			
Haemulon album	Data Deficient	Margate		✓
Haemulon aurolineatum	Least Concern			
Haemulon bonariense	Least Concern			
Haemulon carbonarium	Least Concern			
Haemulon chrysargyreum	Least Concern			
Haemulon flavolineatum	Least Concern	French Grunt		✓
Haemulon macrostomum	Least Concern			
Haemulon melanurum	Least Concern	Cottonwick		✓
Haemulon parra	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Haemulon plumierii	Least Concern			
Haemulon sciurus	Least Concern	Blue-striped Grunt		✓
Haemulon striatum	Least Concern			
Haemulon vittatum	Least Concern			
Haemulopsis corvinaeformis	Least Concern			
Halichoeres bathyphilus	Least Concern			
Halichoeres bivittatus	Least Concern	Slippery Dick		✓
Halichoeres caudalis	Least Concern			
Halichoeres cyanocephalus	Least Concern			
Halichoeres garnoti	Least Concern	Yellowhead wrasse		✓
Halichoeres maculipinna	Least Concern			
Halichoeres pictus	Least Concern			
Halichoeres poeyi	Least Concern			
Halichoeres radiatus	Least Concern			
Halieutichthys aculeatus	Least Concern			
Halieutichthys bispinosus	Least Concern			
Haliphron atlanticus	Least Concern			
Halodule wrightii	Least Concern			
Halophila engelmanni	Near Threatened			
Halosauropsis macrochir	Least Concern			
Halosaurus guentheri	Least Concern			
Halosaurus ovenii	Least Concern			
Hansenothuria benti	Least Concern			
Haplophryne mollis	Least Concern			
Haptenchelys texis	Least Concern			
Harengula clupeola	Least Concern			
Harengula humeralis	Least Concern			
Harengula jaguana	Least Concern			
Helicolenus dactylopterus	Least Concern			
Helioseris cucullata	Critically Endangered			
Hemiemblemaria simulus	Least Concern			
Hemiramphus balao	Least Concern			
Hemiramphus brasiliensis	Least Concern			
Heptranchias perlo	Near Threatened			
Herwigia kreffti	Least Concern			
Heteroconger longissimus	Least Concern			
Heterophotus ophistoma	Least Concern			
Heteropriacanthus cruentatus	Least Concern			
Heteroteuthis dispar	Data Deficient			
Hexanchus griseus	Near Threatened			
Hexanchus vitulus	Least Concern			
Himantolophus brevirostris	Data Deficient			
Himantolophus cornifer	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Himantolophus groenlandicus	Least Concern			
Himantolophus rostratus	Data Deficient			
Hippocampus erectus	Vulnerable			
Hippocampus reidi	Near Threatened			
Hippocampus zosterae	Least Concern			
Hirundichthys affinis	Least Concern			
Hirundichthys speculiger	Least Concern			
Hirundichthys volador	Least Concern			
Histrio histrio	Least Concern			
Holacanthus bermudensis	Least Concern			
Holacanthus ciliaris	Least Concern	Queen Angelfish		✓
Holacanthus tricolor	Least Concern	Rock Beauty		✓
Hollardia hollardi	Least Concern			
Hollardia meadi	Least Concern			
Holocentrus adscensionis	Least Concern			
Holocentrus rufus	Least Concern	Longspine Squirrelfish		✓
Holothuria arenicola	Data Deficient			
Holothuria atra	Least Concern			
Holothuria cubana	Least Concern			
Holothuria floridana	Least Concern			
Holothuria glaberrima	Least Concern			
Holothuria grisea	Least Concern			
Holothuria impatiens	Data Deficient			
Holothuria lentiginosa	Least Concern			
Holothuria mexicana	Least Concern			
Holothuria occidentalis	Least Concern			
Holothuria parvula	Least Concern			
Holothuria princeps	Least Concern			
Holothuria pseudofossor	Least Concern			
Holothuria surinamensis	Least Concern			
Holothuria thomasi	Least Concern			
Holtbyrnia innesi	Least Concern			
Hoplostethus mediterraneus	Least Concern			
Hoplostethus occidentalis	Least Concern			
Hoplunnis similis	Least Concern			
Hoplunnis tenuis	Least Concern			
Howella atlantica	Least Concern			
Howella simplex	Least Concern			
Hygophum benoiti	Least Concern			
Hygophum hygomii	Least Concern			
Hygophum macrochir	Least Concern			
Hygophum reinhardtii	Least Concern			
Hygophum taaningi	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Hymenocephalus aterrimus	Least Concern			
Hymenocephalus italicus	Least Concern			
Hymenogadus gracilis	Data Deficient			
Hypanus americanus	Near Threatened			
Hyperoglyphe bythites	Least Concern			
Hypleurochilus bermudensis	Least Concern			
Hypleurochilus pseudoaequipinnis	Least Concern			
Hypleurochilus springeri	Least Concern			
Hypoatherina harringtonensis	Least Concern			
Hypoplectrus aberrans	Least Concern			
Hypoplectrus chlorurus	Least Concern			
Hypoplectrus gemma	Least Concern			
Hypoplectrus gummigutta	Least Concern			
Hypoplectrus guttavarius	Least Concern			
Hypoplectrus indigo	Least Concern			
Hypoplectrus nigricans	Least Concern			
Hypoplectrus providencianus	Least Concern			
Hypoplectrus puella	Least Concern			
Hypoplectrus unicolor	Least Concern	Butter Hamlet		✓
Hyporhamphus unifasciatus	Least Concern			
Hyporthodus mystacinus	Least Concern			
Hyporthodus nigritus	Near Threatened			
Hyporthodus niveatus	Vulnerable			
Hypsoblennius exstochilus	Least Concern			
Ichthyapus ophioneus	Least Concern			
Ichthyococcus ovatus	Least Concern			
Idiacanthus fasciola	Least Concern			
Idiastion kyphos	Least Concern			
Illex coindetii	Least Concern			
Ilyophis brunneus	Least Concern			
Ipnops murrayi	Least Concern			
Isistius brasiliensis	Least Concern			
Isophyllia rigida	Least Concern	Rough Star Coral	✓	
Isophyllia sinuosa	Least Concern			
Isostichopus badionotus	Least Concern			
Istiophorus platypterus	Vulnerable	Sailfish		✓
Isurus oxyrinchus	Endangered			
Isurus paucus	Endangered			
Japetella diaphana	Least Concern			
Jenkinsia lamprotaenia	Least Concern			
Jenkinsia majua	Least Concern			
Justitia longimanus	Data Deficient			
Kajikia albida	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Kali colubrina	Least Concern			
Kali indica	Least Concern			
Kali kerberti	Least Concern			
Kali macrura	Least Concern			
Kali parri	Least Concern			
Kathetostoma cubana	Least Concern			
Katsuwonus pelamis	Least Concern			
Kaupichthys hyoproroides	Least Concern			
Kaupichthys nuchalis	Least Concern			
Kogia breviceps	Least Concern			
Kogia sima	Least Concern			
Kryptophanaron alfredi	Least Concern			
Kyphosus sectatrix	Least Concern	Bermuda Chub		✓
Labichthys carinatus	Least Concern			
Labrisomus nuchipinnis	Least Concern			
Lachnolaimus maximus	Vulnerable	Hogfish		✓
Lactophrys bicaudalis	Least Concern			
Lactophrys trigonus	Least Concern			
Lactophrys triqueter	Least Concern			
Lagenodelphis hosei	Least Concern			
Lagocephalus laevigatus	Least Concern			
Lagocephalus lagocephalus	Least Concern			
Lampadena anomala	Data Deficient			
Lampadena atlantica	Least Concern			
Lampadena chavesi	Least Concern			
Lampadena luminosa	Least Concern			
Lampanyctus alatus	Least Concern			
Lampanyctus festivus	Least Concern			
Lampanyctus nobilis	Least Concern			
Lampanyctus photonotus	Least Concern			
Lampanyctus pusillus	Least Concern			
Lampanyctus tenuiformis	Least Concern			
Lampanyctus vadulus	Least Concern			
Lampris guttatus	Least Concern			
Lamprogrammus niger	Least Concern			
Larimus breviceps	Least Concern			
Larimus fasciatus	Least Concern			
Lasiognathus saccostoma	Least Concern			
Leiostomus xanthurus	Least Concern			
Lepidocybium flavobrunneum	Least Concern			
Lepidophanes gaussi	Least Concern			
Lepidophanes guentheri	Least Concern			
Lepidopus altifrons	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Lepophidium gilmorei	Least Concern			
Lepophidium kallion	Least Concern			
Lepophidium marmoratum	Least Concern			
Lepophidium wileyi	Least Concern			
Leptoderma macrops	Least Concern			
Leptoseris cailleti	Least Concern			
Leptostomias bilobatus	Least Concern			
Leptostomias gladiator	Least Concern			
Leptostomias haplocaulus	Least Concern			
Leptostomias leptobolus	Least Concern			
Lestidiops affinis	Least Concern			
Lestidiops jayakari	Least Concern			
Lestidiops mirabilis	Least Concern			
Lestidium atlanticum	Least Concern			
Lestrolepis intermedia	Least Concern			
Leurochilus acon	Least Concern			
Linkenchelys multipora	Data Deficient			
Linophryne arborifera	Least Concern			
Linophryne coronata	Least Concern			
Linophryne densiramus	Least Concern			
Linophryne macrodon	Least Concern			
Liopropoma aberrans	Least Concern			
Liopropoma carmabi	Least Concern			
Liopropoma eukrines	Least Concern			
Liopropoma mowbrayi	Least Concern			
Liopropoma rubre	Least Concern			
Lipogramma anabantoides	Least Concern			
Lipogramma evides	Least Concern			
Lipogramma flavescens	Data Deficient			
Lipogramma klayi	Least Concern			
Lipogramma levinsoni	Least Concern			
Lipogramma regia	Least Concern			
Lipogramma robinsi	Data Deficient			
Lipogramma rosea	Least Concern			
Lipogramma trilineata	Least Concern			
Lobianchia dofleini	Least Concern			
Lobianchia gemellarii	Least Concern			
Lobotes surinamensis	Least Concern			
Lophiodes beroe	Least Concern			
Lophiodes monodi	Least Concern			
Lophius gastrophysus	Least Concern			
Lophodolos acanthognathus	Least Concern			
Lophodolos indicus	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Lophotus lacepede	Least Concern			
Loweina rara	Least Concern			
Lucayablennius zingaro	Least Concern			
Luciobrotula corethromycter	Least Concern			
Lupinoblennius vinctus	Near Threatened			
Lutjanus analis	Near Threatened			
Lutjanus apodus	Least Concern	Schoolmaster		✓
Lutjanus buccanella	Data Deficient			
Lutjanus campechanus	Vulnerable			
Lutjanus cyanopterus	Vulnerable			
Lutjanus griseus	Least Concern			
Lutjanus jocu	Data Deficient	Dog Snapper		✓
Lutjanus mahogoni	Least Concern			
Lutjanus synagris	Near Threatened			
Lutjanus vivanus	Least Concern			
Luvarus imperialis	Least Concern			
Lythrypnus crocodilus	Least Concern			
Lythrypnus elasson	Least Concern			
Lythrypnus heterochroma	Least Concern			
Lythrypnus minimus	Least Concern			
Lythrypnus nesiotes	Least Concern			
Lythrypnus okapia	Least Concern			
Lythrypnus spilus	Least Concern			
Macroparalepis affinis	Least Concern			
Macroparalepis brevis	Least Concern			
Madracis auretenra	Least Concern			
Madracis carmabi	Least Concern			
Madracis decactis	Critically Endangered			
Madracis formosa	Near Threatened			
Madracis pharensis	Least Concern			
Madracis senaria	Least Concern			
Magnisudis atlantica	Least Concern			
Makaira nigricans	Vulnerable			
Malacanthus plumieri	Least Concern	Sand Tilefish		✓
Malacocephalus laevis	Least Concern			
Malacocephalus occidentalis	Least Concern			
Malacoctenus aurolineatus	Least Concern			
Malacoctenus boehlkei	Least Concern			
Malacoctenus erdmani	Least Concern			
Malacoctenus gilli	Least Concern			
Malacoctenus macropus	Least Concern			
Malacoctenus triangulatus	Least Concern			
Malacoctenus versicolor	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Malacosteus niger	Least Concern			
Malthopsis gnoma	Least Concern			
Manducus maderensis	Data Deficient			
Manicina areolata	Least Concern	Rose Coral	✓	
Margrethia obtusirostra	Data Deficient			
Masturus lanceolatus	Least Concern			
Maurolicus weitzmani	Least Concern			
Meandrina danae	Least Concern			
Meandrina meandrites	Critically Endangered	Maze Coral	✓	
Megaptera novaeangliae	Least Concern			
Melamphaes ebelingi	Data Deficient			
Melamphaes longivelis	Data Deficient			
Melamphaes microps	Least Concern			
Melamphaes polylepis	Data Deficient			
Melamphaes pumilus	Data Deficient			
Melamphaes simus	Least Concern			
Melamphaes suborbitalis	Data Deficient			
Melamphaes typhlops	Data Deficient			
Melanocetus johnsonii	Least Concern			
Melanocetus murrayi	Least Concern			
Melanolagus bericoides	Least Concern			
Melanonus zugmayeri	Least Concern			
Melanorhinus microps	Least Concern			
Melanostomias bartonbeani	Least Concern			
Melanostomias biseriatus	Least Concern			
Melanostomias macrophotus	Least Concern			
Melanostomias margaritifer	Least Concern			
Melanostomias melanopogon	Least Concern			
Melanostomias melanops	Least Concern			
Melanostomias spilorhynchus	Least Concern			
Melanostomias tentaculatus	Least Concern			
Melanostomias valdiviae	Least Concern			
Melichthys niger	Least Concern	Black Durgon		✓
Menticirrhus americanus	Least Concern			
Menticirrhus littoralis	Least Concern			
Menticirrhus saxatilis	Least Concern			
Mentodus facilis	Least Concern			
Mentodus longirostris	Least Concern			
Merluccius bilinearis	Near Threatened			
Mesoplodon densirostris	Least Concern			
Mesoplodon europaeus	Least Concern			
Mesothuria intestinalis	Least Concern			
Mesothuria verrilli	Data Deficient			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Metanephrops binghami	Least Concern			
Micrognathus crinitus	Least Concern			
Microgobius carri	Least Concern			
Microgobius microlepis	Least Concern			
Microlophichthys microlophus	Least Concern			
Micropogonias undulatus	Least Concern			
Microspathodon chrysurus	Least Concern	Yellowtail Damselfish		✓
Microstoma microstoma	Least Concern			
Millepora alcicornis	Vulnerable	Fire Coral	✓	
Millepora complanata	Critically Endangered	Blade Fire Coral	✓	
Mobula birostris	Endangered			
Mobula hypostoma	Endangered			
Mobula mobular	Endangered			
Mobula tarapacana	Endangered			
Mobula thurstoni	Endangered			
Mola mola	Vulnerable			
Monacanthus ciliatus	Least Concern			
Monacanthus tuckeri	Least Concern			
Monolene sessilicauda	Least Concern			
Monomitopus agassizii	Least Concern			
Monomitopus magnus	Least Concern			
Monopenchelys acuta	Least Concern			
Montastraea cavernosa	Least Concern	Great Star Coral		
Moringua edwardsi	Least Concern			
Mulloidichthys martinicus	Least Concern			
Mussa angulosa	Near Threatened			
Mustelus canis	Near Threatened			
Muusoctopus januarii	Least Concern			
Mycetophyllia aliciae	Least Concern			
Mycetophyllia danaana	Critically Endangered			
Mycetophyllia ferox	Critically Endangered	Cactus Coral		✓
Mycetophyllia lamarckiana	Least Concern			
Mycetophyllia reesi	Least Concern			
Mycteroperca bonaci	Near Threatened			
Mycteroperca interstitialis	Vulnerable			
Mycteroperca tigris	Data Deficient			
Mycteroperca venenosa	Near Threatened			
Myctophum affine	Least Concern			
Myctophum asperum	Least Concern			
Myctophum nitidulum	Least Concern			
Myctophum obtusirostre	Least Concern			
Myctophum selenops	Least Concern			
Myctophum spinosum	Least Concern			

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Myrichthys breviceps	Least Concern			
Myrichthys ocellatus	Least Concern			
Myripristis jacobus	Least Concern	Blackbar Soldierfish		✓
Myrophis platyrhynchus	Least Concern			
Myrophis punctatus	Least Concern			
Myxodagnus belone	Data Deficient			
Nannobrachium atrum	Least Concern			
Nannobrachium cuprarium	Least Concern			
Nannobrachium lineatum	Least Concern			
Nansenia longicauda	Data Deficient			
Nansenia pelagica	Data Deficient			
Narcetes stomias	Least Concern			
Narcine bancroftii	Least Concern			
Naucrates ductor	Least Concern			
Nealotus tripes	Least Concern			
Negaprion brevirostris	Vulnerable	Lemon Shark		✓
Nemaclinus atelestos	Least Concern			
Nemichthys curvirostris	Least Concern			
Nemichthys scolopaceus	Least Concern			
Neobathyclupea argentea	Least Concern			
Neobythites elongatus	Least Concern			
Neobythites marginatus	Least Concern			
Neobythites multidigitatus	Data Deficient			
Neobythites multiocellatus	Least Concern			
Neobythites unicolor	Least Concern			
Neoceratias spinifer	Least Concern			
Neoepinnula americana	Least Concern			
Neomerinthe beanorum	Least Concern			
Neonesthes capensis	Least Concern			
Neoniphon marianus	Least Concern			
Neoscopelus macrolepidotus	Least Concern			
Neoscopelus microchir	Least Concern			
Nephropsis aculeata	Least Concern			
Nephropsis agassizii	Least Concern			
Nephropsis neglecta	Least Concern			
Nephropsis rosea	Least Concern			
Nes longus	Least Concern			
Nesiarchus nasutus	Least Concern			
Nettastoma melanurum	Least Concern			
Nettastoma syntresis	Least Concern			
Nettenchelys exoria	Least Concern			
Nettenchelys inion	Least Concern			
Nettenchelys pygmaea	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Nezumia aequalis	Least Concern			
Nezumia cyrano	Least Concern			
Nezumia sclerorhynchus	Least Concern			
Nezumia suilla	Least Concern			
Nomeus gronovii	Least Concern			
Notacanthus chemnitzii	Least Concern			
Notolychnus valdiviae	Least Concern			
Notoscopelus caudispinosus	Least Concern			
Notoscopelus resplendens	Least Concern			
Nybelinella erikssoni	Data Deficient			
Octopus briareus	Least Concern			
Oculina diffusa	Least Concern			
Oculina varicosa	Least Concern			
Ocyurus chrysurus	Data Deficient	Yellowtail Snapper		✓
Odontoscion dentex	Least Concern			
Odontostomops normalops	Least Concern			
Ogcocephalus corniger	Least Concern			
Ogcocephalus cubifrons	Least Concern			
Ogcocephalus nasutus	Least Concern			
Ogcocephalus parvus	Least Concern			
Ogcocephalus pumilus	Least Concern			
Ogcocephalus rostellum	Least Concern			
Ogilbia boehlkei	Least Concern			
Ogilbia sabaji	Least Concern			
Ogilbia suarezae	Least Concern			
Ogilbichthys kakuki	Least Concern			
Ogilbichthys longimanus	Least Concern			
Ommastrephes bartramii	Least Concern			
Omosudis lowii	Least Concern			
Oneirodes eschrichtii	Least Concern			
Onykia aequatorialis	Data Deficient			
Ophichthus gomesii	Least Concern			
Ophichthus melanoporus	Least Concern			
Ophichthus menezesi	Least Concern			
Ophidion lagochila	Least Concern			
Ophidion nocomis	Least Concern			
Ophidion puck	Data Deficient			
Ophioblennius atlanticus	Least Concern			
Ophioblennius macclurei	Least Concern			
Opisthonema oglinum	Least Concern			
Opisthoproctus grimaldii	Least Concern			
Opisthoproctus soleatus	Least Concern			
Opisthoteuthis agassizii	Data Deficient			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Opistognathus aurifrons	Least Concern			
Opistognathus gilberti	Least Concern			
Opistognathus leprocarus	Least Concern			
Opistognathus macrognathus	Least Concern			
Opistognathus maxillosus	Least Concern			
Opistognathus megalepis	Least Concern			
Opistognathus robinsi	Least Concern			
Opistognathus whitehursti	Least Concern			
Opsanus phobetron	Least Concern			
Orbicella annularis	Endangered	Boulder Star Coral	✓	
Orbicella faveolata	Endangered	Mountainous Star Coral	✓	
Orbicella franksi	Near Threatened	Boulder Star Coral	✓	
Orcinus orca	Data Deficient			
Ornithoteuthis antillarum	Least Concern			
Orthopristis chrysoptera	Least Concern			
Ostichthys trachypoma	Least Concern			
Otophidium chickcharney	Least Concern			
Otophidium dormitator	Least Concern			
Oxynotus caribbaeus	Least Concern			
Oxyporhamphus similis	Least Concern			
Oxyurichthys stigmalophius	Least Concern			
Pachystomias microdon	Least Concern			
Paelopatides grisea	Data Deficient			
Palinurellus gundlachi	Least Concern			
Panulirus argus	Data Deficient			
Panulirus guttatus	Least Concern			
Panulirus laevicauda	Data Deficient			
Parabathymyrus oregoni	Least Concern			
Parablennius marmoreus	Least Concern			
Paraclinus barbatus	Least Concern			
Paraclinus cingulatus	Least Concern			
Paraclinus fasciatus	Least Concern			
Paraclinus grandicomis	Least Concern			
Paraclinus infrons	Least Concern			
Paraclinus marmoratus	Least Concern			
Paraclinus naeorhegmis	Least Concern			
Paraclinus nigripinnis	Least Concern			
Paraconger caudilimbatus	Least Concern			
Parahollardia lineata	Least Concern			
Paralepis brevirostris	Least Concern			
Paralepis coregonoides	Least Concern			
Paralepis elongata	Least Concern			
Paralichthys albigutta	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Paralichthys oblongus	Least Concern			
Paralichthys squamilentus	Least Concern			
Parasphyraenops incisus	Least Concern			
Parastichopus regalis	Least Concern			
Parasudis truculenta	Least Concern			
Parazen pacificus	Least Concern			
Pareques acuminatus	Least Concern			
Pareques iwamotoi	Least Concern			
Pareques umbrosus	Least Concern			
Parexocoetus hillianus	Least Concern			
Pariah scotius	Least Concern			
Paroncheilus affinis	Least Concern			
Parophidion schmidti	Least Concern			
Parribacus antarcticus	Least Concern			
Pempheris poeyi	Least Concern			
Pempheris schomburgkii	Least Concern			
Penetopteryx nanus	Least Concern			
Penopus microphthalmus	Least Concern			
Pentacheles validus	Least Concern			
Pentherichthys atratus	Least Concern			
Peponocephala electra	Least Concern			
Peristedion brevirostre	Least Concern			
Peristedion ecuadorense	Least Concern			
Peristedion greyae	Least Concern			
Peristedion imberbe	Least Concern			
Peristedion longispatha	Least Concern			
Peristedion truncatum	Least Concern			
Peristedion unicuspis	Data Deficient			
Petrotyx sanguineus	Least Concern			
Phaeoptyx conklini	Least Concern			
Phaeoptyx pigmentaria	Least Concern			
Phaeoptyx xenus	Least Concern			
Photocorynus spiniceps	Least Concern			
Photonectes achirus	Least Concern			
Photonectes braueri	Least Concern			
Photonectes caerulescens	Least Concern			
Photonectes dinema	Least Concern			
Photonectes leucospilus	Least Concern			
Photonectes margarita	Least Concern			
Photonectes mirabilis	Least Concern			
Photonectes parvimanus	Least Concern			
Photonectes phyllopogon	Least Concern			
Photostomias goodyeari	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Photostomias guernei	Least Concern			
Photostylus pycnopterus	Least Concern			
Phtheirichthys lineatus	Least Concern			
Phyllorhinichthys balushkini	Least Concern			
Physeter macrocephalus	Vulnerable			
Physiculus fulvus	Least Concern			
Pickfordiateuthis bayeri	Data Deficient			
Pickfordiateuthis pulchella	Data Deficient			
Pinnichthys saurimimica	Data Deficient			
Platybelone argalus	Least Concern			
Platygillellus rubrocinctus	Least Concern			
Platygillellus smithi	Data Deficient			
Plectranthias garrupellus	Least Concern			
Plectrypops retrospinis	Least Concern			
Poecilopsetta beanii	Least Concern			
Poecilopsetta inermis	Least Concern			
Pogonias cromis	Least Concern			
Pollichthys mauli	Least Concern			
Polyacanthonotus merretti	Least Concern			
Polycheles perarmatus	Least Concern			
Polydactylus octonemus	Least Concern			
Polydactylus oligodon	Least Concern			
Polydactylus virginicus	Least Concern			
Polyipnus asteroides	Least Concern			
Polyipnus laternatus	Least Concern			
Polymetme thaeocoryla	Least Concern			
Polymixia lowei	Least Concern			
Polymixia nobilis	Least Concern			
Pomacanthus arcuatus	Least Concern	Gray Angelfish		✓
Pomacanthus paru	Least Concern			
Pontinus castor	Least Concern			
Pontinus longispinis	Least Concern			
Pontinus nematophthalmus	Least Concern			
Porites astreoides	Least Concern	Mustard Hill Coral	✓	
Porites divaricata	Least Concern	Lavender Finger Coral	✓	
Porites furcata	Least Concern			
Porites porites	Least Concern	Finger Coral	✓	
Porogadus silus	Data Deficient			
Poromitra capito	Data Deficient			
Poromitra crassiceps	Least Concern			
Poromitra megalops	Data Deficient			
Priacanthus arenatus	Least Concern			
Priolepis hipoliti	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Prionace glauca	Near Threatened			
Prionotus alatus	Least Concern			
Prionotus carolinus	Least Concern			
Prionotus evolans	Least Concern			
Prionotus martis	Least Concern			
Prionotus murielae	Data Deficient			
Prionotus ophryas	Least Concern			
Prionotus paralatus	Least Concern			
Prionotus roseus	Least Concern			
Prionotus scitulus	Least Concern			
Prionotus stearnsi	Least Concern			
Pristiophorus schroederi	Least Concern			
Pristipomoides aquilonaris	Least Concern			
Pristipomoides macrophthalmus	Least Concern			
Pristis pectinata	Critically Endangered			
Prognathodes aculeatus	Least Concern			
Prognathodes guyanensis	Least Concern			
Prognichthys glaphyrae	Least Concern			
Prognichthys occidentalis	Least Concern			
Promethichthys prometheus	Least Concern			
Pronotogrammus martinicensis	Least Concern			
Psenes cyanophrys	Least Concern			
Psenes maculatus	Least Concern			
Psenes pellucidus	Least Concern			
Pseudocaranx dentex	Least Concern			
Pseudodiploria clivosa	Near Threatened	Knobby Brain Coral	✓	
Pseudodiploria strigosa	Critically Endangered	Brain Coral	✓	
Pseudogramma gregoryi	Least Concern			
Pseudomyrophis frio	Least Concern			
Pseudorca crassidens	Near Threatened			
Pseudoscopelus altipinnis	Least Concern			
Pseudoscopelus obtusifrons	Least Concern			
Pseudoscopelus scriptus	Least Concern			
Pseudoscopelus scutatus	Least Concern			
Pseudotriakis microdon	Least Concern			
Pseudupeneus maculatus	Least Concern	Spotted Goatfish		✓
Psilotris alepis	Least Concern			
Psilotris batrachodes	Least Concern			
Psilotris celsus	Least Concern			
Psilotris kaufmani	Least Concern			
Ptereleotris helenae	Least Concern			
Pteroplatytrygon violacea	Least Concern			
Pterycombus brama	Least Concern			

IUCN Red List for The Bahamas Species Observed at Calypso Cove Site during Field Assessements for EIA Highlighted

Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Pterygioteuthis giardi	Least Concern			
Pycnocraspedum phyllosoma	Data Deficient			
Quassiremus ascensionis	Least Concern			
Rachycentron canadum	Least Concern			
Ranzania laevis	Least Concern			
Regalecus glesne	Least Concern			
Remora albescens	Least Concern			
Remora australis	Least Concern			
Remora brachyptera	Least Concern			
Remora osteochir	Least Concern			
Remora remora	Least Concern			
Rhamphocetichthys savagei	Least Concern			
Rhincodon typus	Endangered			
Rhomboplites aurorubens	Vulnerable			
Rhynchactis macrothrix	Data Deficient			
Rhynchoconger gracilior	Least Concern			
Rhynchohyalus natalensis	Least Concern			
Risor ruber	Least Concern			
Robinsia catherinae	Least Concern			
Rondeletia bicolor	Least Concern			
Rosenblattichthys hubbsi	Least Concern			
Rostroraja bahamensis	Least Concern			
Rouleina attrita	Least Concern			
Rouleina maderensis	Least Concern			
Ruvettus pretiosus	Least Concern			
Rypticus bistrispinus	Least Concern			
Rypticus bornoi	Least Concern			
Rypticus carpenteri	Least Concern			
Rypticus randalli	Least Concern			
Rypticus saponaceus	Least Concern			
Rypticus subbifrenatus	Least Concern			
Sardinella aurita	Least Concern			
Sargocentron bullisi	Least Concern			
Sargocentron coruscum	Least Concern			
Sargocentron poco	Least Concern			
Sargocentron vexillarium	Least Concern			
Saurenchelys stylura	Least Concern			
Saurida brasiliensis	Least Concern			
Saurida caribbaea	Least Concern			
Saurida normani	Least Concern			
Saurida suspicio	Least Concern			
Scaergus unicirrhus	Data Deficient			
Scartella cristata	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Scarus coelestinus	Data Deficient	Blue Parrotfish		✓
Scarus coeruleus	Least Concern			
Scarus guacamaia	Near Threatened			
Scarus iseri	Least Concern			
Scarus taeniopterus	Least Concern			
Scarus vetula	Least Concern	Queen Parrotfish		✓
Schultzea beta	Least Concern			
Sciaenops ocellatus	Least Concern			
Scolymia cubensis	Critically Endangered			
Scolymia lacera	Critically Endangered			
Scomber colias	Least Concern			
Scomberomorus cavalla	Least Concern			
Scomberomorus regalis	Least Concern			
Scombrolabrax heterolepis	Least Concern			
Scopelarchoides danae	Least Concern			
Scopelarchus analis	Least Concern			
Scopelarchus guentheri	Least Concern			
Scopelarchus michaelsarsi	Least Concern			
Scopelengys tristis	Least Concern			
Scopeloberyx opisthopterus	Least Concern			
Scopeloberyx robustus	Data Deficient			
Scopelogadus beanii	Data Deficient			
Scopelogadus mizolepis	Least Concern			
Scopelosaurus argenteus	Least Concern			
Scopelosaurus mauli	Least Concern			
Scopelosaurus smithii	Least Concern			
Scorpaena agassizii	Least Concern			
Scorpaena albifimbria	Least Concern			
Scorpaena bergii	Least Concern			
Scorpaena brasiliensis	Least Concern			
Scorpaena calcarata	Least Concern			
Scorpaena dispar	Least Concern			
Scorpaena grandicornis	Least Concern			
Scorpaena inermis	Least Concern			
Scorpaena isthmensis	Least Concern			
Scorpaena plumieri	Least Concern			
Scorpaenodes caribbaeus	Least Concern			
Scorpaenodes tredecimspinosus	Least Concern			
Scyliorhinus meadi	Least Concern			
Scyliorhinus torrei	Least Concern			
Scyllarides aequinoctialis	Least Concern			
Scyllarides nodifer	Least Concern			
Scyllarus chacei	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Searsia koefoedi	Least Concern			
Selar crumenophthalmus	Least Concern			
Selene vomer	Least Concern			
Semirossia tenera	Least Concern			
Sepioteuthis sepioidea	Least Concern			
Seriola dumerili	Least Concern			
Seriola fasciata	Least Concern			
Seriola rivoliana	Least Concern			
Serranus annularis	Least Concern			
Serranus atrobranchus	Least Concern			
Serranus baldwini	Least Concern			
Serranus luciopercanus	Least Concern			
Serranus notospilus	Least Concern			
Serranus phoebe	Least Concern			
Serranus tabacarius	Least Concern			
Serranus tigrinus	Least Concern	Harlequin Bass		✓
Serranus tortugarum	Least Concern			
Serrivomer beanii	Least Concern			
Serrivomer lanceolatoides	Least Concern			
Setarches guentheri	Least Concern			
Siderastrea radians	Least Concern	Lesser Starlet Coral	✓	
Siderastrea siderea	Critically Endangered	Massive Starlet Coral	✓	
Sigmops bathyphilus	Least Concern			
Snyderidia canina	Least Concern			
Solenastrea bournoni	Least Concern			
Solenastrea hyades	Least Concern			
Sonoda paucilampa	Least Concern			
Sparisoma atomarium	Least Concern			
Sparisoma aurofrenatum	Least Concern			
Sparisoma chrysopterum	Least Concern			
Sparisoma radians	Least Concern			
Sparisoma rubripinne	Least Concern	Yellowtail Parrotfish		✓
Sparisoma viride	Least Concern	Stoplight Parrotfish		✓
Spectrunculus grandis	Least Concern			
Sphagemacrurus grenadae	Least Concern			
Sphoeroides dorsalis	Least Concern			
Sphoeroides greeleyi	Least Concern			
Sphoeroides nephelus	Least Concern			
Sphoeroides pachygaster	Least Concern			
Sphoeroides spengleri	Least Concern			
Sphoeroides testudineus	Least Concern			
Sphyraena barracuda	Least Concern	Barracuda		✓
Sphyraena borealis	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Sphyraena guachancho	Least Concern			
Sphyraenops bairdianus	Least Concern			
Sphyrna lewini	Critically Endangered			
Sphyrna mokarran	Critically Endangered			
Sphyrna tiburo	Endangered			
Sphyrna zygaena	Vulnerable			
Spirula spirula	Least Concern			
Springeria longirostris	Least Concern			
Squalus cubensis	Least Concern			
Starksia atlantica	Least Concern			
Starksia culebrae	Least Concern			
Starksia elongata	Least Concern			
Starksia fasciata	Least Concern			
Starksia hassi	Least Concern			
Starksia lepicoelia	Least Concern			
Starksia nanodes	Least Concern			
Starksia ocellata	Least Concern			
Stathmonotus gymnodermis	Least Concern			
Stathmonotus hemphillii	Least Concern			
Stathmonotus stahli	Least Concern			
Stathmonotus tekla	Least Concern			
Stegastes adustus	Least Concern			
Stegastes diencaeus	Least Concern			
Stegastes leucostictus	Least Concern	Beaugregory		✓
Stegastes partitus	Least Concern	Bicolor Damselfish		✓
Stegastes planifrons	Least Concern			
Stegastes xanthurus	Least Concern			
Steindachneria argentea	Least Concern			
Stellifer lanceolatus	Least Concern			
Stemonosudis intermedia	Least Concern			
Stemonosudis rothschildi	Least Concern			
Stemonosudis siliquiventer	Least Concern			
Stenella attenuata	Least Concern			
Stenella clymene	Least Concern			
Stenella coeruleoalba	Least Concern			
Stenella frontalis	Least Concern			
Stenella longirostris	Least Concern			
Steno bredanensis	Least Concern			
Stephanoberyx monae	Least Concern			
Stephanocoenia intersepta	Near Threatened			
Stephanolepis hispidus	Least Concern			
Stephanolepis setifer	Least Concern			
Stereomastis sculpta	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Sternoptyx diaphana	Least Concern			
Sternoptyx pseudobscura	Least Concern			
Sthenoteuthis pteropus	Least Concern			
Stomias affinis	Least Concern			
Stomias brevibarbatus	Least Concern			
Stomias longibarbatus	Least Concern			
Strongylura notata	Least Concern			
Strongylura timucu	Least Concern			
Stygnobrotula latebricola	Least Concern			
Stylephorus chordatus	Least Concern			
Styracura schmardae	Endangered			
Sudis atrox	Least Concern			
Sudis hyalina	Data Deficient			
Sula dactylatra	Least Concern			
Syacium gunteri	Least Concern			
Syacium micrurum	Least Concern			
Syacium papillosum	Least Concern			
Symbolophorus rufinus	Least Concern			
Symbolophorus veranyi	Least Concern			
Symphurus arawak	Least Concern			
Symphurus diomedeanus	Least Concern			
Symphurus marginatus	Least Concern			
Symphurus ommaspilus	Least Concern			
Symphurus parvus	Least Concern			
Symphurus piger	Least Concern			
Symphurus plagiusa	Least Concern			
Symphurus pusillus	Least Concern			
Symphurus rhytisma	Least Concern			
Symphurus stigmosus	Least Concern			
Symphurus tessellatus	Least Concern			
Symphysanodon berryi	Least Concern			
Symphysanodon octoactinus	Least Concern			
Synagrops bellus	Least Concern			
Synagrops japonicus	Least Concern			
Synagrops spinosus	Least Concern			
Synallactes crucifera	Least Concern			
Synaphobranchus affinis	Least Concern			
Synaphobranchus brevidorsalis	Least Concern			
Synaphobranchus dolichorhynchus	Data Deficient			
Synaphobranchus kaupii	Least Concern			
Synaphobranchus oregoni	Least Concern			
Syngnathus caribbaeus	Least Concern			
Syngnathus floridae	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Syngnathus pelagicus	Least Concern			
Syngnathus springeri	Least Concern			
Synodus foetens	Least Concern			
Synodus intermedius	Least Concern			
Synodus poeyi	Least Concern			
Synodus saurus	Least Concern	Bluestripe Lizardfish		✓
Synodus synodus	Least Concern			
Syringodium filiforme	Least Concern			
Taaningichthys bathyphilus	Least Concern			
Taaningichthys minimus	Least Concern			
Talismania antillarum	Least Concern			
Talismania homoptera	Least Concern			
Talismania mekistonema	Least Concern			
Taractichthys longipinnis	Least Concern			
Tetracheledone spinicirrus	Data Deficient			
Tetragonurus atlanticus	Least Concern			
Tetrapturus georgii	Data Deficient			
Tetrapturus pfluegeri	Least Concern			
Thalassia testudinum	Least Concern	Turtle Grass	✓	
Thalassoma bifasciatum	Least Concern	Bluehead Wrasse		✓
Thaumatichthys binghami	Least Concern			
Thunnus alalunga	Least Concern			
Thunnus albacares	Least Concern			
Thunnus atlanticus	Least Concern			
Thunnus obesus	Vulnerable			
Thunnus thynnus	Least Concern			
Thysanoteuthis rhombus	Least Concern			
Tigrigobius dilepis	Least Concern			
Tigrigobius gemmatus	Least Concern			
Tigrigobius macrodon	Least Concern			
Tigrigobius multifasciatus	Least Concern			
Tigrigobius pallens	Least Concern			
Tigrigobius saucrus	Least Concern			
Tomicodon cryptus	Least Concern			
Tomicodon fasciatus	Least Concern			
Tomicodon reitzae	Least Concern			
Tomicodon rupestris	Least Concern			
Torpedo andersoni	Least Concern			
Trachinocephalus myops	Least Concern			
Trachinotus falcatus	Least Concern	Permit		✓ ✓
Trachinotus goodei	Least Concern			
Trachipterus arcticus	Least Concern			
Trachonurus sulcatus	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Trachyscorpia cristulata	Least Concern			
Tremoctopus violaceus	Least Concern			
Trichopsetta melasma	Least Concern			
Trinectes inscriptus	Least Concern			
Tursiops truncatus	Least Concern			
Tylosurus acus	Least Concern			
Tylosurus crocodilus	Least Concern			
Umbrina coroides	Least Concern			
Uncisudis advena	Least Concern			
Uraspis secunda	Least Concern			
Urobatis jamaicensis	Least Concern			
Uroconger syringinus	Least Concern			
Urophycis floridana	Least Concern			
Uropterygius macularius	Least Concern			
Valenciennellus tripunctulatus	Least Concern			
Varicus adamsi	Least Concern			
Varicus bucca	Least Concern			
Varicus imswe	Data Deficient			
Varicus nigritus	Data Deficient			
Varicus veliguttatus	Least Concern			
Venefica proboscidea	Least Concern			
Venefica procera	Least Concern			
Ventrifossa macropogon	Least Concern			
Ventrifossa mucocephalus	Least Concern			
Verilus sordidus	Least Concern			
Vinciguerria attenuata	Least Concern			
Vinciguerria nimbaria	Least Concern			
Vinciguerria poweriae	Least Concern			
Vitreledonella richardi	Least Concern			
Vomerogobius flavus	Data Deficient			
Willemoesia forceps	Least Concern			
Xanthichthys ringens	Least Concern			
Xenodermichthys copei	Least Concern			
Xenolepidichthys dalgleishi	Least Concern			
Xenomystax austrinus	Least Concern			
Xenomystax bidentatus	Least Concern			
Xenomystax congroides	Least Concern			
Xenophthalmichthys danae	Least Concern			
Xiphias gladius	Near Threatened			
Xyelacyba myersi	Least Concern			
Xyrichtys martinicensis	Least Concern			
Xyrichtys novacula	Least Concern			
Xyrichtys splendens	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Yarrella blackfordi	Least Concern			
Zalieutes mcgintyi	Least Concern			
Zapogon evermanni	Least Concern			
Zenion hololepis	Least Concern			
Zenopsis conchifer	Least Concern			
Ziphius cavirostris	Least Concern			
Zu cristatus	Least Concern			
Albula vulpes	Near Threatened	Bonefish	✓	
Abarema glauca	Near Threatened			
Abutilon leonardii	Near Threatened			
Acalypha alopecuroidea	Least Concern			
Acanthis flammea	Least Concern			
Accipiter striatus	Least Concern			
Acoelorraphe wrightii	Least Concern			
Agave cacozela	Endangered			
Agave nashii	Endangered			
Ageratina havanensis	Least Concern			
Agraulis vanillae	Least Concern			
Albizia lebbeck	Least Concern			
Aleurites moluccanus	Least Concern			
Allophylus cominia	Least Concern			
Alvaradoa amorphoides	Least Concern			
Amazona leucocephala	Near Threatened			
Ammodramus savannarum	Least Concern			
Amyris elemifera	Least Concern	Torchwood	✓	
Andropogon virginicus	Least Concern			
Annona glabra	Least Concern			
Annona montana	Least Concern			
Annona mucosa	Least Concern			
Annona reticulata	Least Concern			
Anolis angusticeps	Least Concern			
Anolis brunneus	Near Threatened			
Anolis carolinensis	Least Concern			
Anolis distichus	Least Concern			
Anolis equestris	Least Concern			
Anolis fairchildi	Vulnerable			
Anolis sagrei	Least Concern	Bahamian Brown Anole	✓	
Anolis scriptus	Least Concern			
Anolis smaragdinus	Least Concern			
Antrostomus carolinensis	Near Threatened			
Archilochus colubris	Least Concern			
Ardisia escallonioides	Least Concern			
Aristelliger barbouri	Data Deficient			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Aristolochia passiflorifolia	Least Concern			
Artibeus jamaicensis	Least Concern			
Asplenium dentatum	Least Concern			
Ateleia popenoei	Critically Endangered			
Athene cunicularia	Least Concern			
Auerodendron northropianum	Vulnerable			
Axonopus compressus	Least Concern			
Ayenia tenuicaulis	Endangered			
Baccharis dioica	Least Concern			
Baccharis halimifolia	Least Concern			
Badiera oblongata	Least Concern			
Banara minutiflora	Least Concern			
Bartramia longicauda	Least Concern			
Basiphyllaea corallicola	Least Concern			
Battus devilliers	Least Concern			
Battus polydamas	Least Concern			
Bauhinia variegata	Least Concern			
Bernardia dichotoma	Least Concern			
Bolboschoenus robustus	Least Concern			
Bonania cubana	Least Concern			
Bontia daphnoides	Data Deficient			
Borrichia arborescens	Least Concern	Sea Marigold	✓	
Bourreria succulenta	Least Concern			
Brachyphylla nana	Least Concern			
Bunchosia glandulosa	Least Concern			
Burhinus bistriatus	Least Concern			
Bursera brunea	Endangered			
Bursera frenningiae	Vulnerable		✓	
Buteo jamaicensis	Least Concern			
Buxus bahamensis	Least Concern			
Caesalpinia bahamensis	Least Concern			
Cakile lanceolata	Least Concern			
Calidris subruficollis	Near Threatened			
Callicarpa americana	Least Concern			
Callicarpa hitchcockii	Endangered			
Canavalia rosea	Least Concern	Beach Bean	✓	
Canella winterana	Least Concern			
Capsicum annuum	Least Concern			
Cardellina canadensis	Least Concern			
Cardiospermum halicacabum	Least Concern			
Casasia clusiifolia	Least Concern	Seven Year Apple	✓	
Casearia laetioides	Least Concern			
Catalpa macrocarpa	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Catesbaea foliosa	Near Threatened			
Catesbaea parviflora	Least Concern			
Cathartes aura	Least Concern			
Catharus fuscescens	Least Concern			
Catharus guttatus	Least Concern			
Catharus minimus	Least Concern			
Catharus swainsoni	Least Concern			
Celtis iguanaea	Least Concern			
Cenchrus echinatus	Least Concern	Burr Grass	✓	
Cenchrus tribuloides	Least Concern			
Cesonia irvingi	Data Deficient			
Cestrum bahamense	Least Concern			
Cestrum diurnum	Least Concern			
Chaetura pelagica	Vulnerable			
Chamaecrista caribaea	Vulnerable			
Chamaecrista glandulosa	Least Concern			
Chamaecrista lineata	Least Concern	Narrowpod Sensitive Pea	✓	
Chilabothrus argentum	Critically Endangered			
Chilabothrus chrysogaster	Near Threatened			
Chilabothrus exsul	Vulnerable			
Chilabothrus schwartzi	Endangered			
Chilabothrus strigilatus	Least Concern			
Chilonatalus tumidifrons	Near Threatened			
Chiococca alba	Least Concern			
Chionanthus bumelioides	Least Concern			
Chloris radiata	Least Concern			
Chondestes grammacus	Least Concern			
Chordeiles gundlachii	Least Concern			
Chrysobalanus icaco	Least Concern			
Chrysophyllum oliviforme	Least Concern			
Cissus verticillata	Least Concern			
Citharexylum caudatum	Least Concern			
Citharexylum spinosum	Least Concern			
Clusia rosea	Least Concern			
Coccoloba diversifolia	Least Concern	Pigeon Plum	✓	
Coccoloba northropiae	Near Threatened			
Coccoloba uvifera	Least Concern	Sea Grape	✓	
Coccothrinax argentata	Least Concern	Silver Thatch	✓	
Coccothrinax inaguensis	Near Threatened			
Coccyzus americanus	Least Concern			
Coccyzus bahamensis	Near Threatened			
Coccyzus erythropthalmus	Least Concern			
Coccyzus minor	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Coereba flaveola	Least Concern	Bananquit		✓
Colinus virginianus	Near Threatened			
Colubrina arborescens	Least Concern			
Colubrina cubensis	Data Deficient			
Colubrina elliptica	Least Concern			
Columba livia	Least Concern			
Columbina passerina	Least Concern			
Consolea millspaughii	Least Concern			
Consolea nashii	Least Concern			
Contopus caribaeus	Least Concern			
Contopus virens	Least Concern			
Coragyps atratus	Least Concern			
Corchorus hirsutus	Least Concern	Woolly Corchorus	✓	
Cordia sebestena	Least Concern			
Corthylio calendula	Least Concern			
Crescentia cujete	Least Concern			
Crossopetalum aquifolium	Least Concern			
Crossopetalum rhacoma	Least Concern			
Croton discolor	Least Concern			
Croton eluteria	Least Concern	Cascarilla	✓	
Croton flavens	Least Concern			
Croton glabellus	Least Concern			
Cubatyphlops biminiensis	Least Concern			
Cubatyphlops paradoxus	Data Deficient			
Cubophis vudii	Least Concern			
Cyclura carinata	Endangered			
Cyclura cychlura	Vulnerable			
Cyclura rileyi	Endangered			
Cynophalla flexuosa	Least Concern			
Cyperus correllii	Critically Endangered			
Cyperus croceus	Least Concern			
Cyperus odoratus	Least Concern			
Cyperus planifolius	Least Concern			
Damburneya coriacea	Least Concern			
Danaus gilippus	Least Concern			
Delonix regia	Least Concern			
Dendropemon confertiflorus	Least Concern			
Desmanthus pernambucanus	Least Concern			
Desmanthus virgatus	Least Concern			
Digitaria horizontalis	Least Concern			
Digitaria insularis	Least Concern			
Dipteryx odorata	Data Deficient			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Dolichonyx oryzivorus	Least Concern			
Drypetes diversifolia	Least Concern			
Drypetes lateriflora	Least Concern			
Drypetes mucronata	Endangered			
Dumetella carolinensis	Least Concern			
Duranta erecta	Least Concern			
Eclipta prostrata	Least Concern			
Elaeodendron xylocarpum	Least Concern			
Elanoides forficatus	Least Concern			
Eleocharis cellulosa	Least Concern			
Eleocharis flavescens	Least Concern			
Eleocharis interstincta	Least Concern			
Eleutherodactylus planirostris	Least Concern			
Eleutherodactylus rogersi	Least Concern			
Empidonax minimus	Least Concern			
Encyclia plicata	Endangered			
Epictia columbi	Least Concern			
Eragrostis prolifera	Least Concern			
Erechthis levyi	Data Deficient			
Erithalis fruticosa	Least Concern	Black Torch	✓	
Erithalis odorifera	Least Concern			
Ernodea gigantea	Endangered			
Ernodea littoralis	Least Concern	Beach Creeper	✓	
Ernodea millspaughii	Near Threatened			
Erophylla sezekorni	Least Concern			
Erythroxylum areolatum	Least Concern			
Erythroxylum confusum	Least Concern			
Erythroxylum rotundifolium	Least Concern			
Eugenia axillaris	Least Concern			
Eugenia confusa	Least Concern			
Eugenia foetida	Least Concern	Spanish Stopper	✓	
Eugenia monticola	Least Concern			
Eugenia rhombea	Least Concern			
Eugenia uniflora	Least Concern			
Euphorbia articulata	Least Concern			
Euphorbia blodgettii	Least Concern			
Euphorbia centunculoides	Endangered			
Euphorbia gymnonota	Near Threatened			
Euphorbia heterophylla	Least Concern			
Euphorbia longinsulicola	Endangered			
Euphorbia mesembryanthemifolia	Least Concern	Coast Spurge	✓	
Euphorbia minutula	Least Concern			
Euphorbia petiolaris	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Euphorbia tithymaloides	Least Concern			
Euploca procumbens	Least Concern			
Evolvulus bracei	Least Concern			
Exostema caribaeum	Least Concern			
Exostema coriaceum	Data Deficient			
Exothea paniculata	Least Concern			
Ficus americana	Least Concern			
Ficus aurea	Least Concern			
Ficus citrifolia	Least Concern	Shortleaf Wild Fig	✓	
Fimbristylis inaguensis	Least Concern			
Forestiera segregata	Least Concern			
Furcraea hexapetala	Least Concern			
Geocapromys ingrahami	Vulnerable			
Geothlypis formosa	Least Concern			
Geothlypis philadelphia	Least Concern			
Geothlypis rostrata	Least Concern			
Geothlypis tolmiei	Least Concern			
Geotrygon chrysia	Least Concern			
Gochnatia ilicifolia	Least Concern			
Grimmeodendron eglandulosum	Least Concern			
Guaiacum officinale	Endangered	Lignum vitae	✓	
Guaiacum sanctum	Near Threatened	Lignum vitae	✓	
Guapira discolor	Least Concern	Narrowleaf Blolly	✓	
Guapira obtusata	Least Concern			
Guettarda elliptica	Least Concern			
Guettarda krugii	Least Concern	Frogwood	✓	
Guettarda nashii	Vulnerable			
Guettarda scabra	Least Concern			
Guilandina bonduc	Least Concern			
Gyminda latifolia	Least Concern			
Gymnanthes lucida	Least Concern	Crabwood	✓	
Hamelia patens	Least Concern			
Harrisia gracilis	Least Concern			
Helicteres jamaicensis	Least Concern	Blind Eye Bush		
Helicteres semitriloba	Least Concern			
Helmitheros vermivorum	Least Concern			
Hemidactylus garnotii	Least Concern			
Heteroonops tetraspinosus	Least Concern			
Heterosavia bahamensis	Least Concern			
Hibiscus clypeatus	Least Concern			
Hibiscus tiliaceus	Least Concern			
Hippomane mancinella	Least Concern			
Hydrocotyle verticillata	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Hylocereus undatus	Data Deficient			
Hylocichla mustelina	Least Concern			
Hypelate trifoliata	Least Concern			
Hypericum hypericoides	Least Concern			
Hypsirhynchus parvifrons	Least Concern			
Icteria virens	Least Concern			
Icterus galbula	Least Concern			
Icterus northropi	Endangered			
Iguana iguana	Least Concern			
Ilex krugiana	Least Concern			
Ilex nitida	Least Concern			
Indotyphlops braminus	Least Concern			
Ipomoea alba	Least Concern			
Ipomoea pes-caprae	Least Concern	Bay Hops	✓	
Ipomoea sagittata	Least Concern			
Ipomoea tiliacea	Least Concern			
Ipomoea triloba	Least Concern			
Jacaranda caerulea	Least Concern			
Jacquinia berteroi	Least Concern			
Jacquinia keyensis	Least Concern	Joewood	✓	
Jatropha gossypiifolia	Least Concern			
Junco hyemalis	Least Concern			
Juncus roemerianus	Least Concern			
Juniperus barbadensis	Vulnerable			
Lanius ludovicianus	Near Threatened			
Lantana involucrata	Least Concern	Sea Sage	✓	
Lasiacis divaricata	Least Concern	Wild Cane	✓	
Lasiurus minor	Vulnerable			
Lawsonia inermis	Least Concern			
Leiocephalus carinatus	Least Concern			
Leiocephalus greenwayi	Vulnerable			
Leiocephalus inaguae	Least Concern			
Leiocephalus loxogrammus	Least Concern			
Leiocephalus punctatus	Least Concern			
Leiothlypis celata	Least Concern			
Leiothlypis peregrina	Least Concern			
Leiothlypis ruficapilla	Least Concern			
Leiothlypis virginiae	Least Concern			
Leptotila jamaicensis	Least Concern			
Leuconotopicus villosus	Least Concern			
Leucothrinax morrisii	Least Concern			
Lonchocarpus sericeus	Least Concern			
Lonchorhina aurita	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Ludwigia repens	Least Concern			
Lysiloma latisiliquum	Least Concern	Wild Tamarind	✓	
Lysiloma sabicu	Least Concern			
Macrotus waterhousii	Least Concern			
Mammillaria nivosa	Least Concern			
Manilkara jaimiqui	Least Concern			
Margaritaria scandens	Least Concern			
Margarops fuscatus	Least Concern			
Maytenus buxifolia	Least Concern			
Maytenus phyllanthoides	Least Concern			
Melanospiza bicolor	Least Concern			
Mellisuga helenae	Near Threatened			
Melocactus intortus	Least Concern			
Melochia pyramidata	Least Concern			
Melopyrrha violacea	Least Concern			
Metopium toxiferum	Least Concern	Poisonwood	✓	
Miconia elata	Least Concern			
Micronaspis floridana	Endangered			
Mimosa pudica	Least Concern			
Mimus gundlachii	Least Concern	Bahama Mockingbird		✓
Mimus polyglottos	Least Concern	Northern Mockingbird		✓
Mniotilta varia	Least Concern			
Molothrus ater	Least Concern			
Molothrus bonariensis	Least Concern			
Monophyllus redmani	Least Concern			
Morella cerifera	Least Concern			
Morinda royoc	Least Concern			
Mormoops blainvillei	Least Concern			
Mosiera androsiana	Vulnerable			
Mosiera longipes	Near Threatened			
Myiarchus sagrae	Least Concern			
Myiopsitta monachus	Least Concern			
Myrcia zuzygium	Least Concern			
Myrcianthes fragrans	Least Concern			
Myrsine cubana	Least Concern			
Nama jamaicensis	Least Concern			
Neobracea bahamensis	Least Concern			
Nephila clavipes	Least Concern			
Nephrolepis exaltata	Least Concern			
Nesophlox evelynae	Least Concern			
Nesophlox lyrura	Least Concern			
Noctilio leporinus	Least Concern			
Nyctiellus lepidus	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Oeceoclades maculata	Least Concern			
Oncidium ensatum	Least Concern			
Opuntia stricta	Least Concern			
Osmunda spectabilis	Least Concern			
Oxyrhynchus volubilis	Least Concern			
Palicourea pubescens	Least Concern			
Panicum amarum	Least Concern			
Pantherophis guttatus	Least Concern			
Papilio andraemon	Least Concern			
Papilio aristodemus	Least Concern			
Papilio cresphontes	Least Concern			
Parkinsonia aculeata	Least Concern			
Parthenocissus quinquefolia	Least Concern			
Paspalum acutifolium	Near Threatened			
Paspalum caespitosum	Least Concern			
Paspalum fimbriatum	Least Concern			
Paspalum paniculatum	Least Concern			
Paspalum setaceum	Least Concern			
Passerculus sandwichensis	Least Concern			
Passerina caerulea	Least Concern			
Passerina ciris	Least Concern			
Passerina cyanea	Least Concern			
Passiflora pallida	Least Concern			
Passiflora pectinata	Least Concern	Wild Apricot	✓	
Patagioenas leucocephala	Near Threatened			
Pavo cristatus	Least Concern			
Pavonia paludicola	Least Concern			
Pavonia spinifex	Least Concern			
Pelicinus marmoratus	Least Concern			
Pera bumeliifolia	Least Concern			
Persea palustris	Vulnerable			
Persicaria punctata	Least Concern			
Petrochelidon fulva	Least Concern			
Phasianus colchicus	Least Concern			
Pheucticus ludovicianus	Least Concern			
Pholidoscelis auberi	Least Concern			
Pholidoscelis maynardii	Least Concern			
Phonipara canora	Least Concern			
Physalis angulata	Least Concern			
Picramnia pentandra	Least Concern			
Picrodendron baccatum	Least Concern			
Pilosocereus polygonus	Least Concern			
Pilosocereus royenii	Least Concern	Dildo Cactus	✓	

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Pimenta dioica	Least Concern			
Pinus caribaea	Least Concern			
Piranga ludoviciana	Least Concern			
Piranga olivacea	Least Concern			
Piranga rubra	Least Concern			
Piscidia piscipula	Least Concern			
Pisonia aculeata	Least Concern			
Pisonia rotundata	Data Deficient			
Pithecellobium histrix	Least Concern			
Pithecellobium unguis-cati	Least Concern			
Pluchea carolinensis	Least Concern			
Plumeria obtusa	Least Concern	White Frangipani	✓	
Plumeria tuberculata	Data Deficient			
Polioptila caerulea	Least Concern			
Polygala wilsonii	Endangered			
Pooecetes gramineus	Least Concern			
Procyon lotor	Least Concern			
Progne dominicensis	Least Concern			
Protonotaria citrea	Least Concern			
Prunus myrtifolia	Least Concern			
Pseudocarpidium wrightii	Least Concern			
Pseudophoenix sargentii	Vulnerable	Buccaneer Palm	✓	
Psidium guajava	Least Concern			
Psilotum nudum	Least Concern			
Psychotria ligustrifolia	Least Concern			
Psychotria nervosa	Least Concern			
Pteridium caudatum	Least Concern			
Pteronotus macleayii	Least Concern			
Pteronotus quadridens	Least Concern			
Quadrella cynophallophora	Least Concern			
Rachicallis americana	Least Concern	Sandfly Bush	✓	
Randia aculeata	Least Concern	Box Briar	✓	
Rauvolfia nitida	Least Concern			
Rhynchosia minima	Least Concern			
Rhynchospora colorata	Least Concern			
Riccordia bracei	Extinct			
Riccordia elegans	Extinct			
Riccordia ricordii	Least Concern			
Rochefortia spinosa	Least Concern			
Roystonea regia	Least Concern			
Sabal palmetto	Least Concern			
Salicornia perennis	Least Concern			
Sapindus saponaria	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Sarcomphalus taylorii	Least Concern			
Sayornis phoebe	Least Concern			
Scaevola plumieri	Least Concern	Inkberry	✓	
Schaefferia frutescens	Least Concern			
Schoepfia schreberi	Least Concern			
Scleria baldwinii	Least Concern			
Scleria lithosperma	Least Concern			
Scleria muehlenbergii	Least Concern			
Scleria tenella	Least Concern			
Seiurus aurocapilla	Least Concern			
Selasphorus rufus	Near Threatened			
Selenicereus grandiflorus	Least Concern			
Selenicereus pteranthus	Data Deficient			
Senna atomaria	Least Concern			
Senna obtusifolia	Least Concern			
Senna occidentalis	Least Concern			
Sesuvium portulacastrum	Least Concern	Sea Purslane	✓	
Setaria parviflora	Least Concern			
Setophaga americana	Least Concern			
Setophaga caerulescens	Least Concern			
Setophaga castanea	Least Concern			
Setophaga cerulea	Near Threatened			
Setophaga citrina	Least Concern			
Setophaga coronata	Least Concern			
Setophaga discolor	Least Concern			
Setophaga fusca	Least Concern			
Setophaga kirtlandii	Near Threatened			
Setophaga magnolia	Least Concern			
Setophaga pensylvanica	Least Concern			
Setophaga petechia	Least Concern			
Setophaga pinus	Least Concern			
Setophaga pityophila	Least Concern			
Setophaga ruticilla	Least Concern	American Redstart		✓
Setophaga striata	Near Threatened			
Setophaga tigrina	Least Concern			
Setophaga townsendi	Least Concern			
Sideroxylon americanum	Least Concern			
Sideroxylon celastrinum	Least Concern			
Sideroxylon foetidissimum	Least Concern			
Sideroxylon salicifolium	Least Concern			
Simarouba glauca	Least Concern			
Sitta insularis	Critically Endangered			
Smilax gracilior	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Solanum bahamense	Least Concern	Canker Berry	✓	
Solanum erianthum	Least Concern			
Solidago sempervirens	Least Concern			
Spathodea campanulata	Least Concern			
Spermacoce felis-insulae	Critically Endangered			
Spermacoce inaguensis	Vulnerable			
Spermacoce laevis	Least Concern			
Spermacoce remota	Least Concern			
Spermacoce tetraquetra	Least Concern			
Sphaerodactylus argus	Least Concern			
Sphaerodactylus copei	Near Threatened			
Sphaerodactylus corticola	Least Concern			
Sphaerodactylus inaguae	Endangered			
Sphaerodactylus mariguanae	Endangered			
Sphaerodactylus nigropunctatus	Least Concern			
Sphaerodactylus notatus	Least Concern			
Sphyrapicus varius	Least Concern			
Spindalis zena	Least Concern			
Spinus tristis	Least Concern			
Spiranthes torta	Least Concern			
Spiza americana	Least Concern			
Spizella passerina	Least Concern			
Sporobolus indicus	Least Concern			
Sporobolus pumilus	Least Concern			
Sporobolus virginicus	Least Concern	Seashore Rushgrass	✓	
Stachytarpheta fruticosa	Least Concern			
Stachytarpheta jamaicensis	Least Concern	Worry Vine	✓	
Stenandrium droseroides	Near Threatened			
Stenostomum lucidum	Least Concern			
Stenostomum myrtifolium	Least Concern			
Stenotaphrum secundatum	Least Concern			
Streptopelia decaocto	Least Concern			
Streptopelia roseogrisea	Least Concern			
Strumpfia maritima	Least Concern	Mosquitobush	✓	
Swietenia mahagoni	Near Threatened			
Symphyotrichum lucayanum	Near Threatened			
Tabebuia bahamensis	Least Concern	Five Fingers	✓	
Tabebuia heterophylla	Least Concern			
Tabebuia lepidota	Least Concern			
Tara vesicaria	Least Concern			
Tarentola americana	Least Concern			
Tecoma stans	Least Concern			
Terminalia molinetii	Least Concern			

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Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Tetrazygia bicolor	Least Concern			
Thespesia populnea	Least Concern	Seaside Mahoe	✓	
Thouinia discolor	Least Concern			
Thrinax radiata	Least Concern			
Tiaris olivaceus	Least Concern			
Tillandsia fasciculata	Least Concern			
Tolumnia guibertiana	Least Concern			
Tolumnia lucayana	Endangered			
Toxicodendron radicans	Least Concern			
Toxostoma rufum	Least Concern			
Trema lamarckianum	Least Concern			
Trichostigma octandrum	Least Concern			
Trifolium pratense	Least Concern			
Triumfetta semitriloba	Least Concern			
Tropidophis canus	Vulnerable			
Tropidophis curtus	Least Concern			
Turdus migratorius	Least Concern			
Turdus plumbeus	Least Concern			
Turnera ulmifolia	Least Concern			
Typhlops lumbricalis	Least Concern			
Tyrannus dominicensis	Least Concern			
Tyrannus forficatus	Least Concern			
Tyrannus verticalis	Least Concern			
Vachellia acuifera	Least Concern			
Vachellia choriophylla	Data Deficient	Cinnecord	✓	
Vachellia farnesiana	Least Concern			
Vachellia macracantha	Least Concern			
Vachellia tortuosa	Least Concern			
Vallesia antillana	Least Concern			
Varronia bahamensis	Least Concern			
Varronia brittonii	Least Concern			
Varronia bullata	Least Concern			
Varronia lucayana	Near Threatened			
Vermivora bachmanii	Critically Endangered			
Vermivora cyanoptera	Least Concern			
Vireo altiloquus	Least Concern			
Vireo crassirostris	Least Concern	Thick-billed Vireo		✓
Vireo flavifrons	Least Concern			
Vireo griseus	Least Concern			
Vireo olivaceus	Least Concern			
Vireo philadelphicus	Least Concern			
Vireo solitarius	Least Concern			
Volkameria aculeata	Least Concern			

IUCN Red List for The Bahamas Species Observed at Calypso Cove Site during Field Assessements for EIA Highlighted

Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Waltheria indica	Least Concern			
Ximenia americana	Least Concern			
Xylosma buxifolia	Least Concern			
Zamia angustifolia	Vulnerable			
Zamia integrifolia	Near Threatened			
Zamia lucayana	Critically Endangered			
Zanthoxylum fagara	Least Concern	Wild Lime		✓
Zanthoxylum flavum	Vulnerable			
Zapoteca formosa	Least Concern			
Zenaida asiatica	Least Concern			
Zenaida aurita	Least Concern			
Adiantum capillus-veneris	Least Concern			
Agelaius phoeniceus	Least Concern			
Aix sponsa	Least Concern			
Ammannia baccifera	Least Concern			
Anas crecca	Least Concern			
Anas platyrhynchos	Least Concern			
Anax concolor	Least Concern			
Anax junius	Least Concern			
Anhinga anhinga	Least Concern			
Anser rossii	Least Concern			
Aramus guarauna	Least Concern			
Aythya collaris	Least Concern			
Baccharis glomeruliflora	Least Concern			
Bacopa monnieri	Least Concern			
Boehmeria cylindrica	Least Concern			
Bombycilla cedrorum	Least Concern			
Botaurus lentiginosus	Least Concern			
Brachymesia furcata	Least Concern			
Branta canadensis	Least Concern			
Bubulcus ibis	Least Concern			
Calidris himantopus	Least Concern			
Calopogon tuberosus	Least Concern			
Cardellina pusilla	Least Concern			
Celithemis eponina	Least Concern			
Celosia argentea	Least Concern			
Circus hudsonius	Least Concern			
Commelina diffusa	Least Concern			
Commelina erecta	Least Concern			
Coryphaeschna ingens	Least Concern			
Crotophaga ani	Least Concern			
Dalbergia ecastaphyllum	Least Concern			
Dendrocygna autumnalis	Least Concern			

IUCN Red List for The Bahamas Species Observed at Calypso Cove Site during Field Assessements for EIA Highlighted

Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Dendrocygna bicolor	Least Concern			
Dichondra micrantha	Least Concern			
Distichlis spicata	Least Concern			
Dryophytes cinereus	Least Concern			
Dryophytes squirellus	Least Concern			
Dythemis rufinervis	Least Concern			
Echinochloa colona	Least Concern			
Eleocharis geniculata	Least Concern			
Empidonax flaviventris	Least Concern			
Empidonax virescens	Least Concern			
Enallagma civile	Least Concern			
Eragrostis atrovirens	Least Concern			
Erythemis simplicicollis	Least Concern			
Erythemis vesiculosa	Least Concern			
Erythrodiplax justiniana	Least Concern			
Erythrodiplax umbrata	Least Concern			
Eudocimus albus	Least Concern			
Falco sparverius	Least Concern			
Fimbristylis cymosa	Least Concern			
Fimbristylis dichotoma	Least Concern			
Fimbristylis ferruginea	Least Concern			
Fimbristylis littoralis	Least Concern			
Fimbristylis ovata	Least Concern			
Fimbristylis schoenoides	Least Concern			
Gastrophryne carolinensis	Least Concern			
Gynacantha ereagris	Least Concern			
Gynacantha nervosa	Least Concern			
Heliotropium curassavicum	Least Concern			
Hirundo rustica	Least Concern			
Idiataphe cubensis	Least Concern			
Ilex cassine	Least Concern			
Ischnura hastata	Least Concern			
Ischnura ramburii	Least Concern			
Juncus bufonius	Least Concern			
Lestes scalaris	Data Deficient			
Lestes spumarius	Least Concern			
Libellula needhami	Least Concern			
Limnothlypis swainsonii	Least Concern			
Lithobates grylio	Least Concern			
Lithobates sphenocephalus	Least Concern			
Macrodiplax balteata	Least Concern			
Mareca strepera	Least Concern			
Megaceryle alcyon	Least Concern			

IUCN Red List for The Bahamas Species Observed at Calypso Cove Site during Field Assessements for EIA Highlighted

Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Melaleuca quinquenervia	Least Concern			
Melanerpes carolinus	Least Concern			
Melanerpes superciliaris	Least Concern			
Melospiza georgiana	Least Concern			
Melospiza lincolnii	Least Concern			
Micrathyria didyma	Least Concern			
Myiarchus crinitus	Least Concern			
Najas guadalupensis	Least Concern			
Nomonyx dominicus	Least Concern			
Nymphaea odorata	Least Concern			
Oporornis agilis	Least Concern			
Osmunda regalis	Least Concern			
Osteopilus septentrionalis	Least Concern			
Oxyura jamaicensis	Least Concern			
Pachydiplax longipennis	Least Concern			
Panicum repens	Least Concern			
Pantala flavescens	Least Concern			
Pantala hymenaea	Least Concern			
Parkesia motacilla	Least Concern			
Parkesia noveboracensis	Least Concern			
Paspalum distichum	Least Concern			
Paspalum vaginatum	Least Concern			
Passer domesticus	Least Concern			
Pentodon pentandrus	Least Concern			
Petrochelidon pyrrhonota	Least Concern			
Phragmites australis	Least Concern			
Phyla nodiflora	Least Concern			
Platalea ajaja	Least Concern			
Podilymbus podiceps	Least Concern			
Polygonum punctatum	Least Concern			
Porphyrio martinicus	Least Concern			
Porzana carolina	Least Concern			
Progne subis	Least Concern			
Proserpinaca palustris	Least Concern			
Pteris vittata	Least Concern			
Quiscalus quiscula	Near Threatened			
Rallus limicola	Least Concern			
Rhynchospora holoschoenoides	Least Concern			
Riparia riparia	Least Concern			
Schoenus nigricans	Least Concern			
Sesbania sericea	Least Concern			
Setophaga dominica	Least Concern			
Setophaga flavescens	Endangered			

IUCN Red List for The Bahamas Species Observed at Calypso Cove Site during Field Assessements for EIA Highlighted

Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Setophaga palmarum	Least Concern			
Setophaga virens	Least Concern			
Sialia sialis	Least Concern			
Spatula cyanoptera	Least Concern			
Spizella pallida	Least Concern			
Tachybaptus dominicus	Least Concern			
Tachycineta bicolor	Least Concern			
Tachycineta cyaneoviridis	Endangered			
Trachemys stejnegeri	Lower Risk/ near threatened			
Trachemys terrapen	Vulnerable			
Tramea abdominalis	Least Concern			
Tramea insularis	Least Concern			
Tramea lacerata	Least Concern			
Tramea onusta	Least Concern			
Triacanthagyna trifida	Least Concern			
Tringa solitaria	Least Concern			
Tyrannus caudifasciatus	Least Concern			
Tyrannus cubensis	Endangered			
Tyrannus tyrannus	Least Concern			
Tyto alba	Least Concern			
Utricularia purpurea	Least Concern			
Xanthocephalus xanthocephalus	Least Concern			
Zenaida macroura	Least Concern	Mourning Dove		✓✓
Zonotrichia leucophrys	Least Concern			
Acrostichum aureum	Least Concern			
Acrostichum danaeifolium	Least Concern			
Actitis macularius	Least Concern			
Anas acuta	Least Concern			
Anas bahamensis	Least Concern			
Anas rubripes	Least Concern			
Anser caerulescens	Least Concern			
Anthus rubescens	Least Concern			
Ardea alba	Least Concern	Great Egret		✓
Ardea herodias	Least Concern	Great Blue Heron		✓
Arenaria interpres	Least Concern	Ruddy Turnstone		✓
Aythya affinis	Least Concern			
Aythya americana	Least Concern			
Aythya marila	Least Concern			
Aythya valisineria	Least Concern			
Bucephala albeola	Least Concern			
Bucephala clangula	Least Concern			
Butorides striata	Least Concern	Green Heron		✓

IUCN Red List for The Bahamas Species Observed at Calypso Cove Site during Field Assessements for EIA Highlighted

Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Calidris alba	Least Concern			
Calidris alpina	Least Concern			
Calidris canutus	Near Threatened			
Calidris fuscicollis	Least Concern			
Calidris mauri	Least Concern			
Calidris melanotos	Least Concern			
Calidris minutilla	Least Concern	Least Sandpiper		✓
Calidris pusilla	Near Threatened			
Charadrius nivosus	Near Threatened			
Charadrius semipalmatus	Least Concern			
Charadrius vociferus	Least Concern	Killdeer		✓
Chlidonias leucopterus	Least Concern			
Chlidonias niger	Least Concern			
Chordeiles minor	Least Concern			
Corvus ossifragus	Least Concern			
Dendrocygna arborea	Near Threatened			
Egretta caerulea	Least Concern			
Egretta thula	Least Concern			
Egretta tricolor	Least Concern			
Erythrodiplax berenice	Least Concern			
Falco peregrinus	Least Concern			
Fulica americana	Least Concern			
Gallinula galeata	Least Concern			
Gavia immer	Least Concern			
Gavia stellata	Least Concern			
Gelochelidon nilotica	Least Concern			
Geothlypis trichas	Least Concern			
Himantopus himantopus	Least Concern			
Hydroprogne caspia	Least Concern			
Ixobrychus exilis	Least Concern			
Larus atricilla	Least Concern			
Larus delawarensis	Least Concern			
Larus fuscus	Least Concern			
Larus philadelphia	Least Concern			
Larus ridibundus	Least Concern			
Larus smithsonianus	Least Concern			
Limnodromus griseus	Least Concern			
Limosa fedoa	Least Concern			
Limosa haemastica	Least Concern			
Lophodytes cucullatus	Least Concern			
Mareca americana	Least Concern			
Melospiza melodia	Least Concern			
Mergus serrator	Least Concern			

IUCN Red List for The Bahamas Species Observed at Calypso Cove Site during Field Assessements for EIA Highlighted

Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Mycteria americana	Least Concern			
Nannopterum auritus	Least Concern			
Nannopterum brasilianus	Least Concern			
Numenius arquata	Near Threatened			
Numenius phaeopus	Least Concern			
Nyctanassa violacea	Least Concern			
Nycticorax nycticorax	Least Concern			
Pandion haliaetus	Least Concern	Osprey		✓
Pavonia bahamensis	Near Threatened			
Pelecanus erythrorhynchos	Least Concern			
Pelecanus occidentalis	Least Concern			
Phalaropus fulicarius	Least Concern			
Phalaropus lobatus	Least Concern			
Phoenicopterus ruber	Least Concern			
Plegadis falcinellus	Least Concern			
Pluvialis dominica	Least Concern			
Pluvialis squatarola	Least Concern	Black-bellied Plover		✓
Podiceps grisegena	Least Concern			
Rallus crepitans	Least Concern			
Recurvirostra americana	Least Concern			
Rynchops niger	Least Concern			
Spatula clypeata	Least Concern			
Spatula discors	Least Concern			
Steganopus tricolor	Least Concern			
Stelgidopteryx serripennis	Least Concern			
Stercorarius pomarinus	Least Concern			
Sterna forsteri	Least Concern			
Sterna hirundo	Least Concern			
Tringa flavipes	Least Concern	Lesser Yellowlegs		✓
Tringa melanoleuca	Least Concern			
Tringa semipalmata	Least Concern			
Alle alle	Least Concern			
Anous minutus	Least Concern			
Anous stolidus	Least Concern			
Ardenna gravis	Least Concern			
Ardenna grisea	Near Threatened			
Avicennia germinans	Least Concern			
Calonectris borealis	Least Concern			
Caretta caretta	Vulnerable			
Charadrius wilsonia	Least Concern	Wilson's Plover		✓
Chelonia mydas	Endangered	Green Turtle		✓
Conocarpus erectus	Least Concern	Buttonwood		✓
Cystophora cristata	Vulnerable			

IUCN Red List for The Bahamas Species Observed at Calypso Cove Site during Field Assessements for EIA Highlighted

Scientific Name	Red List Category	Common Name (for species Observed)	Direct Impact	Indirect Impact
Dermochelys coriacea	Vulnerable			
Egretta rufescens	Near Threatened	Reddish Egret		✓
Eretmochelys imbricata	Critically Endangered			
Euphagus cyanocephalus	Least Concern			
Falco columbarius	Least Concern			
Fregata magnificens	Least Concern			
Fulmarus glacialis	Least Concern			
Haematopus palliatus	Least Concern	American Oystercatcher		✓
Hydrobates leucorhous	Vulnerable			
Laguncularia racemosa	Least Concern	White Mangrove		✓
Larus marinus	Least Concern			
Morus bassanus	Least Concern			
Neomonachus tropicalis	Extinct			
Oceanites oceanicus	Least Concern			
Onychoprion anaethetus	Least Concern			
Onychoprion fuscatus	Least Concern			
Phaethon aethereus	Least Concern			
Phaethon lepturus	Least Concern			
Plectrophenax nivalis	Least Concern			
Pterodroma cahow	Endangered			
Pterodroma caribbaea	Critically Endangered			
Pterodroma hasitata	Endangered			
Puffinus lherminieri	Least Concern			
Rhizophora mangle	Least Concern	Red Mangrove		✓
Rissa tridactyla	Vulnerable			
Stercorarius longicaudus	Least Concern			
Stercorarius parasiticus	Least Concern			
Sterna dougallii	Least Concern			
Sternula antillarum	Least Concern			
Sturnus vulgaris	Least Concern			
Sula leucogaster	Least Concern			
Sula sula	Least Concern			
Thalasseus maximus	Least Concern			
Thalasseus sandvicensis	Least Concern			
Vanellus vanellus	Near Threatened			
Carcharhinus signatus	Endangered			
Rhizoprionodon porosus	Vulnerable			

Appendix E

Birdlife International, BS026, Long Island and Hog Cay

BS026 Long Island and Hog Cay

Unprotected

COORDINATES 23°35′N 75°16′W
ADMIN REGION Long Island
AREA 81,010 ha
ALTITUDE 0–7 m
HABITAT Rocky areas, shrubland, wetlands, coastline, sea

THREATENED BIRDS 1

CONGREGATORY BIRDS ✓

Site description

Long Island and Hog Cay IBA lies south of Cat Island and south-east of the southern end of the Exumas. The island is about 128 km long and a maximum of 6.5 km wide. Hog Cay is a privately-owned island on the leeward side of northern Long Island. Long Island supports a variety of habitats including shrubland, coppice, freshwater and saltwater wetlands, mangroves swamps and tidal flats. Wetlands are scattered throughout the interior of the island and there are frequent roadside ponds. Fishing and farming are the main occupations of the local population.

Birds

This IBA is significant for supporting a large population of the Vulnerable West Indian Whistling-duck *Dendrocygna arborea* which roost on Hog Cay each night. The island's wetlands are also home to a diversity of waterbirds including ducks, herons, egrets and migratory shorebirds. Sandwich Tern *Sterna sandvicensis* and Roseate Tern *S. dougallii* breed on Hog and Galliott Cays. The breeding population of Laughing Gull *Larus atricilla* is regionally important. The restricted-range Bahamas Mockingbird *Mimus gundlachii* and Thick-billed Vireo *Vireo crassirostris* also occur. A population of the Near Threatened White-crowned Pigeon *Patagioenas leucocephala* occurs, but the numbers involved are unknown.

Other biodiversity

The Near Threatened Gervais's funnel-eared bat *Nyctiellus lepidus* and Brazilian free-tailed bat *Tadarida brasiliensis* occur (along with a number of other bat species).

Conservation

Long Island and Hog Cay IBA is a mixture of crown and privately owned land, but none of it is protected. The owner of Hog Cay provided daily feed for the large flock of *D. arborea* which roost on the cay at night. Residential and urban development is leading to habitat destruction, and illegal hunting is a problem. Feral cats, wild goats and pigs are all common and are impacting the vegetation and nesting birds.

BS027 Conception Island

National Park/Unprotected

COORDINATES 23°50′N 75°06′W
ADMIN REGION Conception Island
AREA 2,905 ha
ALTITUDE 0 m
HABITAT Rocky areas, sea, shrubland

CONGREGATORY BIRDS ✓

Site description

Conception Island IBA lies c.40 km south-west of San Salvador, midway between Cat Island and Rum Cay. It is c.5 km by 2.5 km and it encircles an interior lagoon. The island is uninhabited and comprises coral reefs, sandy beaches, rocky and low coralline cliff shores, mangrove, low scrub and coppice. Offshore to the east lies Booby Cay, and to the south-west is South Rocks. The island is an attractive destination for yachts. The IBA includes marine areas up to 1 km from the islands.

Birds

This IBA is characterised by its breeding seabirds. The population of White-tailed Tropicbird *Phaethon lepturus* is globally significant while those of Audubon's Shearwater *Puffinus lherminieri*, Bridled Tern *Sterna anaethetus* and Brown Noddy *Anous stolidus* are regionally so. Booby Cay has one of the largest colonies of Sooty Tern *S. fuscata* in the Bahamas (and is also where the *A. stolidus* nests). The restricted-range Bahama Mockingbird *Mimus gundlachii* and Bahama Woodstar *Calliphlox evelynae* are present and ducks, herons and shorebirds are common in the interior lagoon. A population of the Near Threatened White-crowned Pigeon *Patagioenas leucocephala* occurs, but the numbers involved are unknown.

Other biodiversity

Critically Endangered hawksbill *Eretmochelys imbricata* and Endangered green *Chelonia mydas* turtles are common in the interior lagoon.

Conservation

Conception Island is owned by the crown and is protected as a national park under the management of the BNT. However, Booby Cay and South Rocks and the surrounding shallow water are not included in the protected area. Hunting and illegal egg collecting by boaters and fishermen stopping over on the island are significant threats to the breeding seabirds. The mouth of the lagoon is sometimes illegally blocked by fishermen in order to catch fish and turtles trapped in the interior.

Appendix F

Landside Flora and Fauna Observed within the Assessment Area

Calypso Cove Plant List for Phase 1 Parcels

The following species were observed and identified during a cursory habitat assessment conducted in landside communities on the site of the proposed Calypso Cove project on Long Island on December 9-11, 2022. The list should be considered as a work-in-progress, and that additional species would be identified if additional surveys were to be conducted, particularly during different times of the year, when other plants would be in bloom. Nomenclature follows "Flora of the Bahama Archipelago' by D.S. Correll and H.B. Correll and/or 'Flowers of the Bahamas and the Turks and Caicos Islands' by K. McNary Wood. with updates as applicable.

Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments
MONOCOTS					
AGAVACEAE					
Agave sp.	Century Plant	Herb	Beach coppices, rocky plains	Occasional	
AMARYLLIDACEAE					
Hymenocallis arenicola	Dune Spider Lily	Herb	Grassy dunes along coasts	Common	
ARECACEAE (PALMAE)					
Coccothrinax argentata	Silver Thatch, Silver Top	Tree	Coastal Coppices, Coppices, Whitelands	Common	
Cocos nucifera	Coconut Palm	Tree	Coastal sands, Cultivated areas	Common	
Pseudophoenix sargentii	Hog Palm, Buccaneer Palm	Tree	Sandy & rocky soils in coppices & thickets		
BROMELIACEAE					
Tillandsia utriculata	Swollen Wild Pine	Epiphyte	Coppice, Blacklands, Whitelands	Occasional	CITES
ORCHIDACEAE					
Encyclia altissima	Tall Orchid	Epiphyte	Coppices, Rocky Scrublands	Occasional	CITES
Encyclia sp. (rufa probable)	Orchid	Epiphyte	Coppices, Rocky Scrublands	Occasional	CITES
POACEAE (GRAMMINEAE)					
Cenchrus sp.	Burr Grass	Herb	Disturbed Areas, Beach foredune	Common	
Eustachys petraea	Finger Grass	Herb	Beach mid-dune, Coppice edges	Occasional	
Lasiacis divaricata	Wild Cane	Herb	Coppices, Roadsides	Common	
Spartina patens	Saltmeadow Cordgrass	Herb	Sandy, seasonally moist soils, salt marshes	Occasional	
Sporobolus virginicus	Seashore Rush-grass	Herb	Beach foredune	Occasional	
Uniola paniculata	Sea Oats	Herb	Beach foredune, sand dunes	Occasional	
SMILACEAE					
Smilax havanensis	Prickly Saw-brier	Vine	Coppices, Brushlands, open areas	Common	

Calypso Cove Plant List for Phase 1 Parcels

Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments
DICOTS					
AIZOACEAE					
Sesuvium portulacastrum	Pondweed, Sea purslane	Ground cover	Sandy beaches, saline flats, rocky areas	Common	
ANACARDIACEAE					
Metopium toxiferum	Poisonwood	Tree	Coppices, Scrublands	Occasional	
APOCYNACEAE					
Plumeria obtusa	White Frangipani	Tree	Rocky scrublands, coppices	Occasional	
Pentalinon luteum	Wild Unction, Lice Bush	Vine	Climbing on shrubs in coppices & rocky soils	Occasional	
Vallesia antillana	Pearl Berry	Shrub	Coppices, scrublands	Occasional	
ASCLEPIADACEAE					
Cynanchum bahamense	Marsh Cynanchum	Vine	Whitelands, scrublands, coastal thickets	Occasional	
ASTERACEAE					
Ambrosia hispida	Sweet Bay, Bay tansy, Soap-bush	Groundcover	Beach foredune, sandy shores	Occasional	
Borrichia arborescens	Lavender, Sea Marigold	Shrub	Coastal sands and rock, brackish margins	Abundant	
Borrichia frutescens	Sea Ox-eye, Bay Marigold	Shrub	Marshes and mud flats near brackish lakes	Uncommon	
Gundlachia corymbosa	Horse Bush	Shrub	Rocky saline flats, Marshes, Coppice edges	Common	
AVICENNACEAE	Mangrove				
Avicennia germinans	Black Mangrove	Tree	Mangrove lagoons, tidal shores	Common	
BIGNONIACEAE					
Tabebuia bahamensis	White Cedar, Five Fingers	Tree	Scrublands, Pinelands, Coppices	Occasional	
BORAGINACEAE					
Argusia (Mallotonia) gnaphalodes	Wild Bay, Sea Lavender	Shrub	Sandy beaches, Foredunes	Occasional	
Bourreria succulenta	Chink Bush, Pigeon Berry	Shrub/Tree	Coppices,	Common	
Myriopus volubilis	Soldier-bush	Vine	Coppices, coppice edges	Occasional	
BURSERACEAE					
Bursera simaruba ??	Gum-elemi, Gumbo Limbo	Tree	Coppices, Scrublands	Occasional	

Calypso Cove Plant List for Phase 1 Parcels

Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments
Bursera frenningae		Tree	Coppices, Scrublands	Common	Endemic (C&C, Freid)
CACTACEAE					
Consolea (Opuntia) millspaughii	Millspaugh's Prickly-Pear	Shrub	Scrublands and rocky plains and hills	Occasional	Endemic, fka *Opuntia nashii*
Consolea (Opuntia) nashii	Cactus Tree, Nash's Prickly Pear	Shrub	Scrublands and rocky plains and hills	Occasional	Endemic, fka *Opuntia nashii*
Pilocereus polygonus	Old Man's Cactus	Shrub	Maritime and coastal rocks, dunes	Common	formerly *Pilocerus millpaughii*
CASUARINACEAE					
Casuarina equisetifolia	Beefwood, Australian Pine	Tree	Sandy Shores, Disturbed coastal areas	Common	NISS
CHENOPODIACEAE					
Sarcocornia virginica	Woody Glasswort	Groundcover	Coastal salt marshes and flats	Occasional	formerly *Salicornia virginicus*
COMBRETACEAE					
Conocarpus erectus	Buttonwood	Shrub/Tree	Coastal wetlands, savannas, salina edges	Abundant	
Conocarpus erectus v. sericea	Silver Buttonwood	Shrub/Tree	Coastal wetlands, savannas, salina edges	Occasional	
Laguncularia racemosa	White Mangrove	Tree	Borders of mangrove mud	Occasional	
CONVOLVULACEAE					
Evolvulus squamosus	Broom Bush	Shrub	Rocky Coppice, Scrublands	Occasional	
Ipomoea pes-caprae	Bay Hops, Bay Winders	Vine	Beaches & coastal rocks	Occasional	
EUPHORBIACEAE					
Ateramnus (fka Gymnanthes) lucida	Crabwood	Shrub	Coastal coppices	Occasional	
Chamaecrista (fka Cassia) lineata	Narrowpod Sensitive Pea	Shrub	Almost ubiquitous, esp dry sandy soils	Occasional	
Chamaecrista lineata	Narrowpod Sensitive Pea	Shrub	Almost ubiquitous, esp dry sandy soils	Occasional	
Croton eluteria	Cascarilla, Sweetwood Bark	Shrub	Open rocky slopes, fields, behind dunes	Occasional	
Croton linearis	Granny-bush, Bay Wormwood	Shrub	Scrublands, rock formations, sandy areas	Occasional	
Euphorbia mesembrianthemifolia	Coast spurge, Seaside spurge	Herb	Maritime sands, Beach dunes	Common	
Phyllanthus epiphyllanthus	Abraham-bush, Hardhead	Herb	Rocky places, Whitelands	Common	
Savia bahamensis	Maiden Bush	Shrub	Coppices, thickets	Occasional	
FABACEAE					
Caesalpinia bahamensis	Brasiletto	Shrub	Coppices, scrublands	Occasional	

Calypso Cove Plant List for Phase 1 Parcels

Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments
Canavalia rosea	Bay Bean, Beach Pea	Vine	Coastal sands, rocks, disturbed areas	Occasional	
Centrosema virginianum	Butterfly Pea, Wild Pea	Vine	Variable habitats, disturbed areas	Occasional	
Lysiloma latisiliquum	Wild Tamarind	Tree	Coppices, Scrublands, Open areas	Occasional	
Pithecellobium keyense	Blackbead, Ram's horn	Tree	Coppices	Occasional	
Vachellia (fka Acacia) choriophylla	Cinnecord	Tree	Coppices	Common	
GOODENACEAE					
Scaevola plumieri	Inkberry, Black-soap	Shrub	Coastal dunes	Common	
LAURACEAE					
Cassytha filiformis	Woe-vine, Love Vine	Vine	Beach backdune, coppices, disturbed areas	Common	
MALVACEAE					
Abutilon permolle	Velvety Abutilon	Shrub	Edges of coppices, disturbed areas	Occasional	
Helicteres jamaicensis	Cow-bush, Blind Eye Bush	Shrub	Coppices, rock flats, saline fields	Occasional	
Sida acuta	Wire-weed	Shrub	Fields, open coppices, disturbed areas	Uncommon	
Thespesia populnea	Seaside Mahoe, cork-tree	Tree	Open disturbed areas	Occasional	
MORACEAE					
Ficus citrifolia	Short-leaved Wild Fig	Tree	Coppices, Pinelands, sinks, rock outcrops	Common	
MYRTACEAE					
Calyptranthes pallens	Spice-wood	Shrub	Coppices, scrublands	Occasional	
Eugenia foetida	Spanish Stopper, White Wattle	Shrub	Scrublands, Coppices	Occasional	
NYCTAGINACEAE					
Guapira discolor	Blolly	Tree	Coppices, Scrublands, rock flats	Occasional	PROTECTED
PASSIFLORACEAE					
Passiflora cupraea	Devil's Pumpkin	Vine	Coastal coppices, thickets, disturbed areas	Occasional	
Passiflora pectinata	Wild Apricot	Vine	Littoral sands, coastal coppice, savannas	Occasional	
POLYGONACEAE					
Coccoloba diversifolia	Pigeon-plum	Tree	Coppices, Scrubland	Common	
Coccoloba uvifera	Seagrape	Tree	Coastal thickets, coastal coppices	Common	

Calypso Cove Plant List for Phase 1 Parcels

Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments
RHAMNACEAE					
Colubrina arborescens	Common Snake-bark, Bitters	Shrub	Coppices, dunes, rocky scrublands	Occasional	
Reynosia septentrionalis	Darling Plum	Shrub	Coppices, scrublands, and rocky flats	Occasional	
RHIZOPHORACEAE					
Rhizophora mangle	Red Mangrove	Tree	Muddy shores, estuarine swamps	Abundant	
RUBIACEAE					
Catesbaea spinosa	Prickly apple, Spanish Guava	Shrub	Coppices, scrublands, fence rows	Occasional	
Erithalis fruticosa	Black Torch, Candlewood	Shrub	Beach dunes, coastal coppices, pinelands,	Common	
Ernodea littoralis	Golden Creeper, Cough Bush	Shrub	Dunes, coastal coppices, disturbed areas	Occasional	
Exostema caribaeum	Fustic	Shrub	Coppices	Occasional	
Genipa (fka Casasia) clusiifolia	Seven-year Apple	Shrub	Coastal Rocks, Coppices	Abundant	
Guettarda krugii	Frogwood, Old Man	Shrub	Scrublands and Rocky Coppices	Occasional	
Guettarda scabra	Rough velvet-seed, Wild Guava	Shrub	Thickets, coppices	Occasional	
Randia aculeata	Box briar	Shrub	Ubiquitous	Common	
Rhachicallis americana	Hog-bush, Sandfly-bush	Shrub	Maritime rocks, coastal coppices	Common	
Strumpfia maritima	Mosquito Bush, Candle Torch	Shrub	Coastal rocks, rocky flats, Coastal coppices	Common	
RUTACEAE					
Amyris elemifera	Torchwood	Tree	Thickets, rocky coppices and sandy soils	Occasional	
Zanthoxylum fagara	Wild lime, Satin-wood	Shrub/Tree	Coppices, scrublands, rocky areas	Common	
SAPOTACEAE					
Manilkara bahamensis	Wild Dilly	Tree	Coppices, Scrublands, Coastal areas	Common	
SCROPHULARIACEAE					
Stemodia maritima	Coast Stemodia, Pawn-bush	Herb	Wet areas, seashores, waste areas	Occasional	
SOLANACEAE					
Solanum bahamense	Canker Berry, Bahamas Nightsl	Shrub	Disturbed areas	Occasional	
STERCULIACEAE					
Melochia tomentosa	Velvety Melochia	Shrub	Whitelands, Scrublands, Coppices	Occasional	

Calypso Cove Plant List for Phase 1 Parcels

Family/Scientific Name	Common Name	Life Form	Habitat	Abundance	Comments
SURIANACEAE					
Suriana maritima	Bay Cedar	Shrub	Beach mid-dune, Rocky shorelines	Common	
THEOPHRASTACEAE					
Jacquinia keyensis	Joe-wood, Ironwood	Shrub	Coastal rocks, Coppices, Scrublands	Common	
TILIACEAE					
Corchorus hirsutus	Wooly Corchorus, Jack Switch	Shrub	Coppices, Scrublands, Fields	Common	
TURNERACEAE					
Turnera ulmifolia	Buttercups, Yellow Alder	Shrub	Beaches, Coastal dunes, Scrublands	Occasional	
VERBENACEAE					
Lantana bahamensis	Black Sage	Shrub	Scrublands, Edges of thickets	Occasional	
Lantana involucrata	Sage Cop, Wild Sage	Shrub	Scrublands, Edges of thickets	Common	
Stachytarpheta jamaicensis	Worry Vine, Bue rat-tail	Shrub	Coppices, Disturbed areas, Scrublands	Occasional	
ZYGOPHYLLACEAE					
Guaiacum officinale	Lignum vitae	Tree	Coastal coppices, coppices	Occasional	
Guaiacum sanctum	Lignum vitae	Tree	Coastal coppices, coppices	Common	

Notes:

Habitats from Correll & Correll; Flora of the Bahama Archipelago

Occurrence Categories:

Abundant = Almost certain to be encountered in suitable habitat

Common = Likely to be encountered in suitable habitat

Occasional = Need to search when in suitable habitat

Uncommon = Observed on the property, but only noticed a couple

Green shading =	Species identified as protected by the Government of the Bahamas as Endemic, Endangered, Threatened or by international treaties.
Orange shading =	Species identified as Culturally, Historically or Economically Protected
Pink shading =	Species identified in Bahamas National Invasive Species Strategy

Endemic status based on designations by Freid, et. al. (2014) and Correll & Correll (1982)

Calypso Cove Landside Animals List

The following species were observed during landside field assessments conducted on the Calypso Cove Phase 1 properties during field investigations from December 9-12, 2022. This list should be considered as a work-in-progress, and that additional species would be identified if additional surveys were conducted, particularly during different times of the year.

Scientific Name	Common Name	Habitat	Abundance
MAMMALS			
Canus lupus domesticus	Domestic Dog	Urban areas, beaches	Occasional
CRUSTACEANS and ARTHROPODS			
Ocypode albicans	Ghost Crab	Sandy Shorelines	Uncommon
Cardisoma guanhumi	Land Crab	Coastal lowlands	Occasional
Coenobita clypeatus	Land Hermit Crab	Above mean high water, among plants	Uncommon
Gecarcinus lateralis	Blackback Land Crab	Mostly sand strand and coppice	Abundant
Uca minax	Fiddler Crab	Saline flats, White Pond, NW Pond	Occasional
MOLLUSKS			
Acanthopluera granulata	West Indian Fuzzy Chiton	Chiton	Intertidal rocks
Batillaria minima	Black Horn Snail	In inland pools in rock	Occasional
Cerion sp.	Peanut snail	Herbaceous & other low-growing vegetation	Common
Hemitrochus varians	Seagrape snail	Coastal uplands	Occasional
Nerita peloronta	Bleeding Tooth Nerite	Intertidal rocks	Common
Nerita tessellata	Checkered Nerite	Intertidal rocks	Common
Nerita versicolor	Four-toothed Nerite	Intertidal rocks	Common
Neritina virginica	Virgin Nerite	Intertidal rocks, esp along sheltered shores	Occasional
Tectarius muricatus	Beaded Periwinkle	Supra-tidal rocks	Common
BIRDS			
Fregata magnificens	Magnificent Frigatebird	Observed over ridge to the east	Aerial only

Calypso Cove Landside Animals List

Scientific Name	Common Name	Habitat	Abundance
Ardea alba	Great Egret	Not observed on subject property, but suitable habitat appears to be present	Occasional - adjoining tract
Ardea herodias	Great Blue Heron	Shorelines & shallow inland wetlands Not observed on subject property, but seen nearby, & suitable habitat appears to be present	Occasional
Egretta rufescens	Reddish Egret	Coastal wetlands, sand flats. Observed on shallow tidal flats west of proposed north channel connection	Common
Butorides virescens	Green Heron	Shorelines & shallow inland wetlands. Observed in mangroves near proposed north channel connection.	Adults & young
Rallus longirostris coryi	Clapper Rail	Mangrove wetlands. Heard in area west of proposed north channel entrance	Occasional
Pluvialis squatarola	Black-bellied Plover	Sandy Shorelines, Salinas. Observed along salina edge to south. Potentially suitable habitat on subject property minimal.	Occasional
Charadrius vociferus	Killdeer	Sandy beaches, saline flats, Heard in flight over subject property	Occasional
Charadrius wilsonia	Wilson's Plover	Sandy beaches. Observed nesting along fringe of salt pond along Transect 5	Occasional
Calidris sp.	Peep	Shorelines, wetland fringes	Occasional
Calidris minutilla	Least Sandpiper	Shorelines, wetland. Observed in salina to south. Potentially suitable habitat on subject property.	Occasional
Arenaria interpres	Ruddy Turnstone	Sandy beaches, rocky shorelines. Observed in salina to south. Potentially suitable habitat on subject property	Common

Calypso Cove Landside Animals List

Scientific Name	Common Name	Habitat	Abundance
Tringa flavipes	Lesser Yellowlegs	Shallow inland wetlands. Observed in salina to south, Photographic evidence of presence in seasonal pond east of proposed channel.	Occasional
Haematopus palliatus	American Oystercatcher	Rocky Shorelines. Observed foraging in Sound, west of proposed north channel entrance	Occasional
Pandion haliaetus	Osprey	Coastal areas, feeds on fish, nests nr water. Two seen repeatedly in vicinity. Nests typically built at prominent locations, but no nests observed.	Uncommon
Falco columbarius	Merlin	Observed atop snag in Coppice	Uncommon
Columba leucocephala	White-crowned Pigeon	Coastal hammock, usu roosts & nests on islands. Observed repeatedly in flight, and roosting near northern tip of island. Unlikely to nest in project area	Uncommon
Columba passerina	Common Ground-dove	Sparsely-vegetated uplands. Frequently observed on site, including w/ young-of-the-year. Likely to nest within project area.	Common
Zenaida macroura	Mourning Dove	Typically in urban/residential areas, but heard frequently; likely to nest within project area.	Occasional
Calliphlox evelynae	Bahama Woodstar	Coppice, typically nr nectar-producing flowers. Observed frequently, including feeding on *Euphorbia gymnonota* . Likely nests in project area.	Uncommon
Ceryle alcyon	Belted Kingfisher	Near open water, feeds on small fish	Uncommon
Hirundinidae	Swallow (unidentified)	typically aerial	Uncommon
Mimus polyglottos	Northern Mockingbird	Typically in urban/residential areas, but seen & heard frequently. Potentially nests within project area.	Occasional

Calypso Cove Landside Animals List

Scientific Name	Common Name	Habitat	Abundance
Mimus gundlachii	Bahama Mockingbird	Coppice, Scrub, woodlands. Seen & heard frequently. Likely nests within project area.	Occasional
Dumetella carolinensis	Gray Catbird	Thickets, shrublands. Migrant, heard occasionally. Likely non-nesting presence from fall thru spring.	Occasional
Vireo crassirostris	Thick-billed Vireo	Thick coppice, bushy forest edges. Frequently heard & seen. Likely nests within project area.	Common
Dendroica coronata	Yellow-rumped Warbler	Semi-open coppice and shrublands	Common
Dendroica discolor	Prairie Warbler	Coppice, thicket & forest	Common
Dendroica palmarum	Palm Warbler	Coppice, thicket, urban areas, agricultural areas. Migrant, nests at northerly latitudes, but likely present on site fall through spring, &/or during migration	Common
Dendroica caerulescens	Black-throated Blue Warbler	Coppice	Uncommon
Coerba flaveola	Bananaquit	Coppice, thicket & forest. Year-round, breeding resident. Heard & seen frequently. Likely nests in project area.	Common
Loxigilla violacea violacea	Greater Antillean Bullfinch	Dense thickets, dense coppice	Occasional
REPTILES and AMPHIBIANS			
Ameiva auberi	Blue-tail Lizard	Semi-open uplands	Uncommon
Anolis sagrei ordinatus	Bahamian Brown Anole	Semi-open uplands	Common
Anolis sp.	Anole	Semi-open uplands	Occasional
INSECTS			
Butterflies and Moths			
Agraulis (Dione) vanillae	Gulf Fritillary Butterfly	Semi-open areas, host plant is Passifloraceae	Common

Calypso Cove Landside Animals List

Scientific Name	Common Name	Habitat	Abundance
Ascalapha odorata	Money Bat Moth, Black Witch	Shady areas, esp rock walls	Uncommon
Chlorostrymon sp.	Hairstreak Butterfly	In open coppice, & feeding on Heliotropium	Uncommon
Heraclides andreamon bonhotei	Bahama Swallowtail	Likely forage on Asclepiaceae	Occasional
Junonia evarete	Black Mangrove Buckeye Butterfly	Shorelines, host plants are Black Mangrove	Uncommon
Pieridae	Small Yellow Butterfly	Observed in weedy groundcovers	Uncommon
Pieridae	Sulfur Butterfly	Observed in weedy groundcovers	Uncommon
Spiders			
Argiope argentata	Silver argiope	in Strumpfia in coastal spray zone	Uncommon
Other Insects			
Acrididae	Grasshopper	Evergreen shrublands	Occasional
Aedes sp.	Mosquitos	Shorelines, coppice, forests, wetlands	Abundant
Apoidea	Bees		
Asilidae	Robber Fly	Encountered in Coastal Coppice	Occasional
Formicidae	Ants	Agricultural shrublands	Abundant
Hymenoptera	Wasp	Evergreen shrublands	Occasional
Musca domesticus	House Fly	Urban environments	Occasional
Nasutitermes costalis	West Indian nasute termites	Coppice and forests	Common
Odonata	Dragonfly	Typically near freshwater & coastal wetlands	Uncommon
Psychidae	Bagworm Moth	Open Coppices	Uncommon

Appendix G

Summary of the Legal and Regulatory Policies And Conventions for the Government of The Bahamas

Summary of the Legal and Regulatory Policies And Conventions for the Government of The Bahamas

Domestic Regulations

Introduction

All development projects are carried out within a framework of national regulations, international conventions, corporate policies, and procedures and recognized third party guidelines, all of which have different applications, remits, requirements, and implications.

The Developer will comply with the legal requirements of The Government of The Bahamas, and The Developer's own internal standards and topic-specific conventions to which The Bahamas is a signatory. The Developer will also consider, when relevant, to the establishment of mitigation measures, the application of relevant international standards including International Finance Corporation (IFC) guidelines and World Bank Environmental, Health and Safety (EHS) Guidelines.

Institutional Framework

The sections below present a summary of the key government policies and statutory instruments and laws relevant to the Project as well as the government departments and national governing bodies and authorities that will have an interest in the EIA.
The Bahamas is organized into a parliamentary constitutional monarchy headed by Queen Elizabeth II. As a member of the Commonwealth, its political and legal traditions are considered to be close to those of the United Kingdom. The country is divided into 32 districts that provide a system of local government, with the exception of Grand Bahama Island, whose affairs are handled directly by the Grand Bahama Port Authority.

Local government in the Bahamas exists in two forms, namely second-schedule and third-schedule district councils. There are a total of 32 local government districts: 13 second-schedule districts, which are further sub-divided into town areas, and 19 third-schedule districts, which are all unitary authorities.

The Government of The Bahamas executive branch consists of, The Prime Minister and his Cabinet of Ministers, which are elected members of Parliament appointed by the Prime Minister.

The Ministry that has direct responsibility for managing environmental affairs in The Bahamas is the Ministry of the Environment.

Bahamas Investment Authority

The Bahamian government's proactive economic growth and development policies are guided by the Bahamas Investment Authority (BIA), established to reduce bureaucratic delays for domestic and international investors.

Operating from the Office of the Prime Minister, the BIA has been designated a "one-stop shop" designed to simplify investing in The Bahamas. The BIA serves as the administrative arm of the National Economic Council and Investment's Board.

The BIA has the following areas of responsibility:

- Develop investment policies
- Promote investment
- Evaluate project proposals
- Monitor and co-ordinate project implementation
- Administer the government's investment concessionary legislation

All non-Bahamians or Permanent Residents seeking to do business in The Bahamas must obtain prior approval from the Bahamas Investment Authority (BIA). The application for BIA approval must be in the form of a comprehensive Project Proposal. The application must include all of the requirements set forth in the Project Proposal Guidelines issued by the BIA. Bahamian legal counsel usually submits the formal application to the BIA along with the required supporting documents.

The application process is as follows:

1. Submit the Project Proposal, along with supporting documents to the BIA.
2. The BIA will process the application and submit the same to the National Economic Council for a determination. The NEC is comprised of a group of Government ministers including the Prime Minister and the Minister of Finance.

3. Depending on the nature of the proposed business activity, the relevant Government Ministry or Agency would be consulted for input:
   a. Ministry of the Environment.
   b. Ministry of Works and Transport.
   c. Ministry of Housing.
   d. Respective Family Island Local Government
   e. Department of Environmental Planning and Protection
4. Once a determination has been made, the BIA will communicate to the applicant in writing. If the determination is favorable, the BIA will issue a "project approval in principle", subject to any stipulated conditions and to satisfying the requirements of the relevant government agencies.

The Ministry of the Environment (MoE)

The MoE's area of responsibility includes:

1. To manage, protect and conserve all land, water, air and living resources of The Bahamas, having regard to the environmental, economic and social benefits they may confer on The Bahamas;
2. To undertake, commission and coordinate environmental studies and research relating to the environment of The Bahamas;
3. Advising as to public or private sector proposals that would significantly affect the environment of The Bahamas; and
4. Providing advice as to procedures for the assessment and monitoring of environmental impacts.

The departments, agencies and authorities under the responsibility of the MoE are:

1. The department responsible for environmental health services;
2. The agency responsible for national geographic information services;
3. The authority responsible for public parks and public beaches;
4. The body responsible for forestry; and
5. The body responsible for scientific research, reviewing Environmental Impact Assessments, advising on environmental projects and administering multilateral environmental agreements.

The Department of Environmental Planning and Protection

The Department of Environmental Planning and Protection (DEPP) is under the responsibility of the Ministry of the Environment. The duty of the Department is to promote best practices in environmental management and to minimize harm to the environment. The Department is comprised of the Director, Deputy Director, Assistant Directors, and appointed environmental officers. The Department is subject to the general control and direction of the Director. The functions of the Department include the regulation, oversight and review of Environmental Management Plans (EMP) and Environmental Impact Assessments (EIA), promoting and enforcing compliance with the Environmental Planning and Protection Act, 2019 (“the Act”) and any regulations made under that Act. The Act makes it a requirement to obtain a Certificate of Environmental Clearance in accordance with prescribed regulations prior to commencing work on a project and it provides that any person who commences work on a project without first obtaining a Certificate of Environmental Clearance commits an offence.

The Act provides for regulations relating to Environmental Management Plans and Environmental Impact Assessments to be issued. The Regulations have not yet been passed, but it is expected that the Regulations, when passed, will address the types of projects, developments and activities which shall require the preparation of an Environmental Management Plan or Environmental Impact Assessment and the procedures for the assessment of Environmental Management Plans and Environmental Impact Assessments as well as the requirements for public consultation.

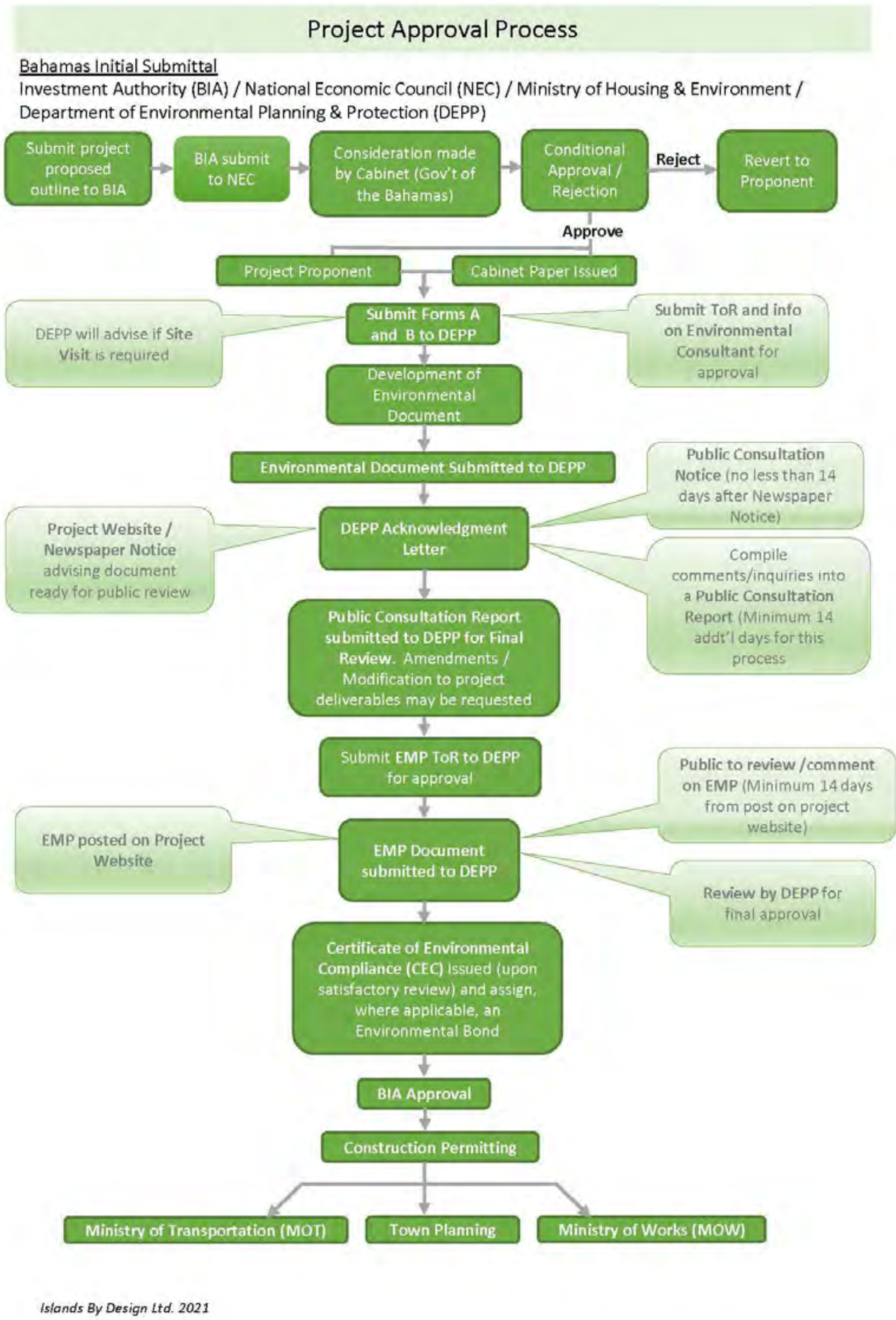

Figure G-1. Project Approval Process

Process for Attaining a Certificate of Environmental Clearance (CEC)

1. Complete Application Forms A & B (www.depp.gov.bs)
   a. Form A- Applications for Preliminary Review of Proposed Project.
   b. Form B- Application for the Certificate of Environmental Clearance (Triplicate).
   c. Pay nonrefundable $100 Fee.
2. Submit Application Form to the Department of Environmental Planning & Protection (DEPP)
   a. Original Signatures/Seals are required on at least one of the forms.
   b. DEPP will issue a letter of acknowledgement and advise on form completeness.
   c. DEPP will advise if a site visit is required.
   d. After a Site Visit, DEPP will request submission of ToR for the Environmental document and request information on the Environmental Consultant.
   e. After information is provided and satisfactorily reviewed in C & D the Applicant can begin development of the environmental document for submission.
3. Environmental Document submitted
   a. 2 Hard copies of the Document and 1 digital copy are required for submission.
   b. Once the document is submitted, DEPP will acknowledge receipt.
   c. Once an acknowledgement letter is issued, the Applicant must place a notice in the Newspaper notifying the public that the environmental document has been submitted to the DEPP.
   d. In the Notice the Applicant MUST advise that the environmental document is available on the Project Website.
   e. In the Notice a date no less than 14 days from the date of publication of the notice can be identified for the Public Consultation.
4. Public Consultation
   a. Public Consultation cannot occur less than 14 days from the date the notice is published in the newspaper.
   b. During the consultation process the Applicant must document all issues raised and responded to. After the consultation meeting, a date of no less than 14 days will be identified for the public to provide additional comments or inquiries regarding the project.
   c. After the completion of the Public Consultation Phase, the Applicant must provide a comprehensive Public Consultation Report which identifies every question or inquiry presented by the Public regarding the project and the report submitted to the DEPP for review.

   d. After review of the Public consultation report the DEPP may require an amendment to the environmental document or a modification to the proposed project deliverables.
5. Environmental Management Document
   a. After the completion of the Public Consultation and final review of the initial environmental documents, an Environmental Management Plan ToR will be requested by the Department. On approval of the ToR the document is to be generated.
   b. Upon submission the document the Applicant must post the EMP to the project's website. The Public will have no less than 14 days to review and provide comment on the document.
6. Award of a CEC
   a. After satisfactory review of all documentation and the Public's comments addressed, the Department may issue a Certificate of Environmental Compliance (CEC) and assign, where applicable, an Environmental Bond in keeping with the Regulations.

The Department of Environmental Health Services (DEHS)

The DEHS is the environmental regulatory department of The Bahamas Government. It is responsible for environmental control, solid waste collection, and disposal. It is also the responsible for enforcing industrial regulation, public health guidelines, for regulating and enforcing public sanitation. The oil spill contingency plans are also responsibility of this Department.

The Bahamas National Trust (BNT)

The Bahamas National Trust is a non-profit organization established through The Bahamas National Trust Act in 1959. It is responsible for establishing and managing national parks and protected areas, historic preservation, public awareness and outreach on environmental issues.

Other Government Agencies

Other government agencies in The Bahamas share specific environmental responsibilities that may be relevant for the proposed Project, which during the approval process may require the procurement of additional information and/or permits. These include the following:

- Department of Fisheries: responsible for enforcing fisheries regulations and establishing marine reserves;
- Department of Agriculture: responsible for the conservation of birds and plants;

- Department of Lands & Surveys, Forestry Unit: responsible for managing forest resources;
- Ministry of Tourism and Aviation: responsible for Road Traffic, Postal Department, Department of Civil Aviation, Department of Meteorology, and Port Department;
- National Emergency Management Agency (NEMA): Mission is, "To reduce the loss of life and property within the Commonwealth of The Bahamas, by ensuring that adequate preparedness and mitigation measures and response and recovery mechanisms are established to counteract the impact of natural, man-made and technological hazards" and
- National Oil Spill Advisory Committee: Purpose is to ensure that The Bahamas is in a state of readiness, as it pertains to oils spills in the territorial and archipelagic waters of The Bahamas.

Other governmental organizations of interest are:

- Bahamas Maritime Authority;
- The Bahamas Electricity Corporation (BPL);
- Water and Sewerage Corporation;
- Ministry of Public Works & Urban Development - Civil Engineering Department;
- Ministry of Public Works & Urban Development - Building Control Division;
- Department of Physical Planning;
- The Royal Bahamas Police Force;
- The Royal Bahamas Defense Force;
- Bahamas Customs;
- Bahamas Immigration;
- Ministry of Tourism;
- Antiquities, Monuments and Museums and
- Bahamas Telecommunications Company (BTC)

National Policy and Legislation

The fundamental objective of Bahamas' environmental policy is to improve the quality of life of population through the reasonable use of natural resources, especially water, and with the aim of achieving sustainable economic development to meet the needs of present and future generations.

The Commonwealth of The Bahamas has established a comprehensive institutional and legal framework for environmental protection and natural resources management. Three key organizations, The Department of Environmental Planning and Protection (DEPP), the Department of Environmental Health Services (DEHS) and The Bahamas National Trust (BNT), together with specific governmental resource management agencies, provide the institutional direction for environmental protection and management. Environmental protection is supported by a number of laws and regulations that control activities in the physical and biological environment. Recent modifications to long-established natural resources laws, and new laws and regulations dealing with the physical environment, have enhanced the existing legal framework. Additional laws are currently under development to update the existing legal structure.

The project will be designed, constructed, operated, and maintained in accordance with applicable Bahamian environmental laws and regulations.

Bahamian legislation which pertains to the physical and natural environment and which may pertain to the proposed development is listed in Table G-1 (specific legislation marked in bold are directly applicable to the project and are described in more detail afterwards).

Table G-1. Overview of Applicable Bahamian Legislation by Title and Chapter

Title IV	
Ch. 18	Consular Relations and Commonwealth Officers Act, 1969
Ch. 26	Public Works Act, 1964
Ch. 28	Out Islands Utilities Act, 1965
Ch. 37	Local Government Act, 1996
Ch. 51	**Antiquities, Monuments, and Museum Act, 1998;** Antiquities, Monuments, and Museum Regulations, 1999
Title XIV	
Ch. 140	International Persons Landholding Act, 1994
Ch. 194	Electricity Act, 1956
Title XIX	
Ch. 195	Out Islands Electricity Act, 1965
Title XX	
Ch. 196	**Water and Sewerage Corporation Act, 1976;** Water Supply Rules, 1953
Ch. 197	Water Supplies (Out Islands) Act, 1953; Water Supplies (Out Islands) Rules
Title XXI	
Ch. 199	Housing Act, 1968; Housing Regulations, 1983
Ch. 200	Buildings Regulation Act, 1971 Buildings Regulation (General) Rules, 1971 Building Regulation (Extension to the Out Islands) Order, 1975
Ch. 201	Roads Act, 1968
Ch. 204	Coast Protection Act, 1968
Title XXV	
Ch. 215	Explosives Act, 1970 Explosives Regulations, 1970
Ch. 216	Explosive Substances (Illegal Use and Possession) Act, 1958
Ch. 217	Inflammable Liquids Act, 1958
Ch. 218	Liquefied Petroleum Gas, Act 1988 Liquefied Petroleum Gas Regulations, 1988
Ch. 219	Petroleum Act, 1978 Petroleum Regulations, 1978
Title XXVI	
Ch. 223	Derelict Motor Vehicles (Disposal) Act, 1967
Ch. 232	**Environmental Health Services Act, 1987**
Title XXX	
Ch. 248	Wild Animals (Protection) Act, 1968
Ch. 249	Wild Birds Protection Act, 1952 Wild Birds Protection (Reserves)
Ch. 250	Plants Protection Act, 1916 Plants Protection Order 1918 Prohibition of the Importation of Plants Order, 1971 Prohibition of the Importation of Plants (State of California) Order, 1982 Plants Protection (Import of Citrus Fruits, Plants and Other Propagative Material from Florida) Order, 1993 Plants Protection (Restriction on Imports of Fruits, Vegetables, Flowers, Plants and other Propagative Materials) Pink Mealybug) Order, 1997 Plant Protection Rules, 1916
Title XXXI	
Ch. 251	Land Surveyors Act, 1975

Table G-1. Overview of Applicable Bahamian Legislation by Title and Chapter

	By-laws of The Bahamas Association of Land Surveyors 1993 Land Surveyors Regulations, 1975
Ch. 252	Acquisition of Land Act, 1913
Ch. 253	Out Islands Dilapidated Buildings Act, 1952
Ch. 257	Private Roads and Subdivisions (Out Islands) Act, 1965
Ch. 258	Subdivisions (Local Improvement Associations) Act, 1965
Ch. 259	Reclamation and Drainage Act, 1937
Ch. 260	**Conservation and Protection of the Physical Landscape of The Bahamas Act, 1997** **Declaration of Protected Trees Order, 1997** **Conservation and Protection of the Physical Landscape of The Bahamas Regulations, 1997**
Ch. 269	**Port Authorities Act, 2006**
Ch. 270	Abutments Act, 1864
Ch. 271	Abutments (Out Islands) Act, 1883
Ch. 274	Abandoned Wreck Act, 1965
Ch. 275	Merchant Shipping (Oil Pollution) Act, 1989 Merchant Shipping (Oil Pollution) (Indemnification of Ship Owners) Regulations 1978
Ch. 278	Water Skiing and Motor Boat Control, 1971 Water Skiing and Motor Boat Control Regulations. 1971
Ch. 282	Archipelagic Waters and Maritime Jurisdiction, 1996
Ch. 283	The Bahamas Maritime Authority Act, 1995
Title XLVIII	
Ch. 391	The Bahamas National Trust Act, 1959 The Bahamas National Trust (Amendment) Act 2010
Ch. 328A	Family Islands Development Encouragement Act, No. 14, 1997 Forestry Act, 2010 **Planning and Subdivision Act, 2010**
Ch. 39 of 2019	**Ministry of the Environment Act, 2019**
Ch. 40 of 2019	**Environmental Planning and Protection Act, 2019** **Extension of Act & EIA regulations 2020**

7.2 International

The Commonwealth of Bahamas is signatory to the international conventions and protocols listed in Table G-2.

Table G-2: International Conventions and Protocols in Force in The Bahamas

Convention/Protocol	Entry in Force / Accession	Detail/Objectives
Convention on Wetlands of International Importance (Ramsar Convention), 1971	June 1997 (entry in force)	The Convention aims to maintain the ecological characteristics of wetlands of international importance and to plan the "wise use", or sustainable use, of all wetlands on the territory of the countries which have ratified the Convention. Its aim is to protect wetlands, in order to stem the progressive encroachment on and loss of wetlands now and in the future.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973	March 1979 (entry in force)	This convention regulates international trade in certain animal and plant species. Depending on the annex in which they are listed, the species are subject to export conditions (with systems of permits and special authorizations). The States must set up the necessary institutions for controlling trade in the species and issue export permits.
Convention of Biological Diversity	September 1993 (entry in force)	This convention has three main objectives: the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. Implementation of this convention entails drafting national strategies for conservation and sustainable utilization of biological diversity. It is considered to be the key document for sustainable development.
United Nations Framework Convention on Climate Change; 1992	June 1992 (entry in force)	The United Nations Framework Convention on Climate Change was adopted in Rio de Janeiro in 1992 by 154 States, in addition to the European Community. It entered into force on 21 March 1994 and in 2004 had been ratified by 189 countries. This convention is the first attempt by the UN to more clearly identify what climate change actually is and how to remedy it.
Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks	January 1997 (entry in force)	To encourage cooperation between States to ensure conservation and promote the objective of optimum utilization of fisheries resources both within and beyond the exclusive economic zone.

Table G-2: International Conventions and Protocols in Force in The Bahamas

Convention/Protocol	Entry in Force / Accession	Detail/Objectives
Kyoto Protocol, 1997	April 1999 (entry in force)	The protocol stipulates legally binding commitments on industrialized countries obliging these countries to reduce the annual average emissions of greenhouse gases by about 5.2% over the period 2008-2012.
United Nations Convention to Combat Desertification; 1994	February 2001 (entry in force)	This convention aims to combat desertification and mitigate the effects of drought through national action programs that incorporate long-term strategies. *Not directly relevant to this project.*
Stockholm Convention on Persistent Organic Pollutants	January 2006 (entry in force)	To protect human health and the environment from persistent organic pollutants.
Basel Convention Controlling Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention), 1989	August 1992 (accession)	Conscious of the damage that could be caused to human health and the environment by hazardous and other wastes and the trans-boundary movements of these wastes, the States undertake to employ strict controls to protect human health and the environment against the harmful effects of the production and management of hazardous and other wastes.
Montreal Protocol on Substances that Deplete the Ozone Layer, 1989	May 1993 (accession)	The Montreal Protocol on Substances that Deplete the Ozone Layer was designed to reduce the production and consumption of ozone depleting substances in order to reduce their abundance in the atmosphere, and thereby protect the earth's ozone Layer.
Vienna Convention for the Protection of the Ozone Layer, 1985 (Vienna Convention)	April 1993 (accession)	This convention served as a framework for efforts to protect the globe's ozone layer. The objectives of the Convention were for Parties to promote cooperation by means of systematic observations, research and information exchange on the effects of human activities on the ozone layer and to adopt legislative or administrative measures against activities likely to have adverse effects on the ozone layer.
International Convention for the Prevention of Pollution from Ships (MARPOL), 1973	May 2011	The purpose of this convention is to regulate pollution by hydrocarbons, chemical products, packaging, garbage, sewage and atmospheric emissions. It is the reference text in the field of marine pollution prevention. The convention is primarily based on the specification of and compliance with technical rules, e.g. requirement for double-hulled oil tankers and tankers carrying chemical products, requirement for oil-water separators and to maintain documentation. The Wider Caribbean Region (WCR) (Caribbean Sea and Gulf of Mexico) became a designated Special Area under Annex V of the MARPOL Convention, which prohibits the discharge of all garbage by ship.

Table G-2: International Conventions and Protocols in Force in The Bahamas

Convention/Protocol	Entry in Force / Accession	Detail/Objectives
International Convention on Civil Liability for Oil Pollution Damage, 1969 and 1992	October 1976 (accession)	International maritime treaty adopted to ensure adequate compensation where oil pollution damage is caused by maritime accidents.
Convention for the Unification of Certain Rules of Law Relating to Assistance and Salvage at Sea Protocol of 1967	February 1913 (accession)	To provide a uniform set of rules governing assistance and salvage at sea.
International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage 1992 (1992 Fund Convention)	July 1976 (accession)	To supplement the International Convention on Civil Liability for Oil Pollution Damage, 1969; to ensure that adequate compensation is available to persons who suffer damage caused by pollution resulting from the escape or the discharge of oil from ships; and to ensure that the oil cargo interests bear a part of the economic consequences of such oil pollution damage, to the relief of the shipping industry.
Convention on Facilitation of International Maritime Traffic, as amended (FAL)	May 1998 (accession)	To prevent unnecessary delays in maritime traffic, to aid co-operation between Governments, and to secure the highest practicable degree of uniformity in formalities and other procedures.
Convention on the International Regulations for Preventing Collisions at Sea (COLREGS)	July 1997 (entry in force)	To update and replace the International Regulations for Preventing Collisions at Sea, 1960; to maintain a high level of safety at sea.
International Convention for the Safety of Life at Sea (SOLAS), 1974	February 2000 (entry in force)	The convention aims to ensure that ships of signatory countries comply with a series of safety standards and practices.
Caribbean Challenge Initiative, 2013.	May 2013	An agreement made between 9 Caribbean government and territories committing them to accelerate and expand efforts to safeguard the Caribbean region's marine and coastal environment, further promote the sustainable use of natural resources through new commitments to conservation.

Table G-2: International Conventions and Protocols in Force in The Bahamas

Convention/Protocol	Entry in Force / Accession	Detail/Objectives
The Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (WCR) or Cartagena Convention. 1983	June 2010	Focused on the protection of the marine environment from pollution within the Caribbean, it includes a series of specific protocols on oil spills, specially protected areas and wildlife and land based sources of marine pollution
United Nations Convention on the Law of the Sea (UNCLOS) (Montego Bay Convention), 1982	July 1983 (entry in force)	This convention defines the powers of enforcement available to the states affected by an illegal act of marine pollution.
International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) 1990	January 2002 (accessi on)	Article 3 of this convention requires that ships and installations at sea have an oil pollution emergency plan. The Developer must develop an Oil Spill Response Plan.
ILO Conventions	May 197 (entry in force)	International labor standards are legal instruments drawn up by the ILO's constituents (governments, employers, and workers) and setting out basic principles and rights at work. They are either conventions, which are legally binding international treaties that may be ratified by member states, or recommendations, which serve as non-binding guidelines.

Appendix H

Calypso Cove Oversize Figures

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Dave D. Taylor, P.Eng., RLS
Geomatics Engineer & Registered Land Surveyor
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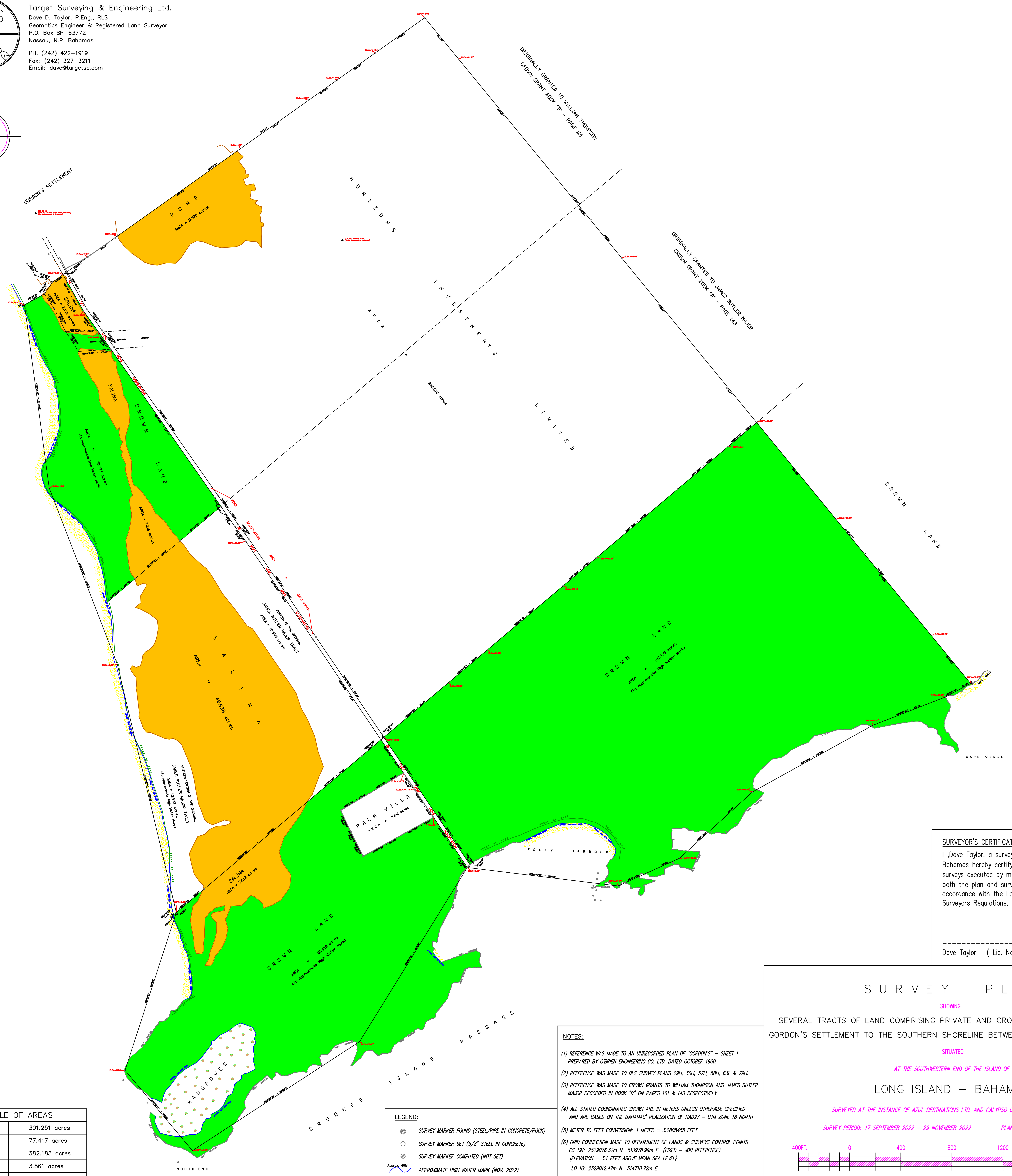

SCHEDULE OF AREAS

CROWN LAND	301.251 acres
SALINAS & POND	77.417 acres
PRIVATE LAND	382.183 acres
ROAD RESERVATION	3.861 acres
TOTAL	764.712 acres

LEGEND:

- SURVEY MARKER FOUND (STEEL/PIPE IN CONCRETE/ROCK)
- SURVEY MARKER SET (5/8" STEEL IN CONCRETE)
- SURVEY MARKER COMPUTED (NOT SET)
- APPROXIMATE HIGH WATER MARK (NOV. 2022)
- SANDY BEACH

NOTES:

(1) REFERENCE WAS MADE TO AN UNRECORDED PLAN OF "GORDON'S" – SHEET 1 PREPARED BY O'BRIEN ENGINEERING CO. LTD. DATED OCTOBER 1960.

(2) REFERENCE WAS MADE TO DLS SURVEY PLANS 29LI, 30LI, 57LI, 58LI, 63L & 79LI.

(3) REFERENCE WAS MADE TO CROWN GRANTS TO WILLIAM THOMPSON AND JAMES BUTLER MAJOR RECORDED IN BOOK "D" ON PAGES 101 & 143 RESPECTIVELY.

(4) ALL STATED COORDINATES SHOWN ARE IN METERS UNLESS OTHERWISE SPECIFIED AND ARE BASED ON THE BAHAMAS' REALIZATION OF NAD27 – UTM ZONE 18 NORTH

(5) METER TO FEET CONVERSION: 1 METER = 3.2808455 FEET

(6) GRID CONNECTION MADE TO DEPARTMENT OF LANDS & SURVEYS CONTROL POINTS
CS 191: 2529076.32m N 513978.99m E (FIXED – JOB REFERENCE)
{ELEVATION = 3.1 FEET ABOVE MEAN SEA LEVEL}
LO 10: 2529012.47m N 514710.72m E

(7) SOME ADDITIONAL DETAILS WILL BE ADDED FOLLOWING THE TOPOGRAPHIC SURVEY.

SURVEYOR'S CERTIFICATE

I ,Dave Taylor, a surveyor registered and licensed in the Bahamas hereby certify that this plan has been made from surveys executed by me or under my personal supervision that both the plan and survey are correct and have been made in accordance with the Land Surveyors Act, 1975 and the Land Surveyors Regulations, 1975 made thereunder.

Dave Taylor (Lic. No. 056)

S U R V E Y   P L A N

SHOWING

SEVERAL TRACTS OF LAND COMPRISING PRIVATE AND CROWN LANDS EXTENDING FROM GORDON'S SETTLEMENT TO THE SOUTHERN SHORELINE BETWEEN SOUTH END & CAPE VERDE

SITUATED

AT THE SOUTHWESTERN END OF THE ISLAND OF

LONG ISLAND – BAHAMAS

SURVEYED AT THE INSTANCE OF AZUL DESTINATIONS LTD. AND CALYPSO COVE DESTINATIONS LTD.

SURVEY PERIOD: 17 SEPTEMBER 2022 – 29 NOVEMBER 2022   PLAN DATE: 15 DECEMBER 2022

400FT. 0 400 800 1200 1600 2000FT.

SCALE: 1 INCH = 400 FEET

JOB REF.: 2022_143

Target Surveying & Engineering Ltd.
Dave D. Taylor, P.Eng., RLS
Geomatics Engineer & Registered Land Surveyor
P.O. Box SP-63772
Nassau, N.P. Bahamas

PH. (242) 422-1919
Fax: (242) 327-3211
Email: dave@targetse.com

SURVEYOR'S CERTIFICATE

I ,Dave Taylor, a surveyor registered and licensed in the Bahamas hereby certify that this plan has been made from surveys executed by me or under my personal supervision that both the plan and survey are correct and have been made in accordance with the Land Surveyors Act, 1975 and the Land Surveyors Regulations, 1975 made thereunder.

Dave Taylor (Lic. No. 056)

TOPOGRAPHIC SURVEY PLAN

SHOWING

SEVERAL TRACTS OF LAND COMPRISING PRIVATE AND CROWN LANDS EXTENDING FROM GORDON'S SETTLEMENT TO THE SOUTHERN SHORELINE BETWEEN SOUTH END & CAPE VERDE

SITUATED

AT THE SOUTHWESTERN END OF THE ISLAND OF

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SURVEYED AT THE INSTANCE OF AZUL DESTINATIONS LTD. AND CALYPSO COVE DESTINATIONS LTD.

SURVEY PERIOD: 17 SEPTEMBER 2022 – 29 NOVEMBER 2022 PLAN DATE: 15 DECEMBER 2022

IMAGERY & LIDAR DATA COLLECTION: NOVEMBER 2022 & JANUARY 2023 PLAN UPDATE: 28 APRIL 2023

400FT. 0 400 800 1200 1600 2000FT.

SCALE: 1 INCH = 400 FEET

JOB REF.: 2022_143

NOTES:

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(7) SOME ADDITIONAL DETAILS WILL BE ADDED FOLLOWING THE TOPOGRAPHIC SURVEY.

LEGEND:

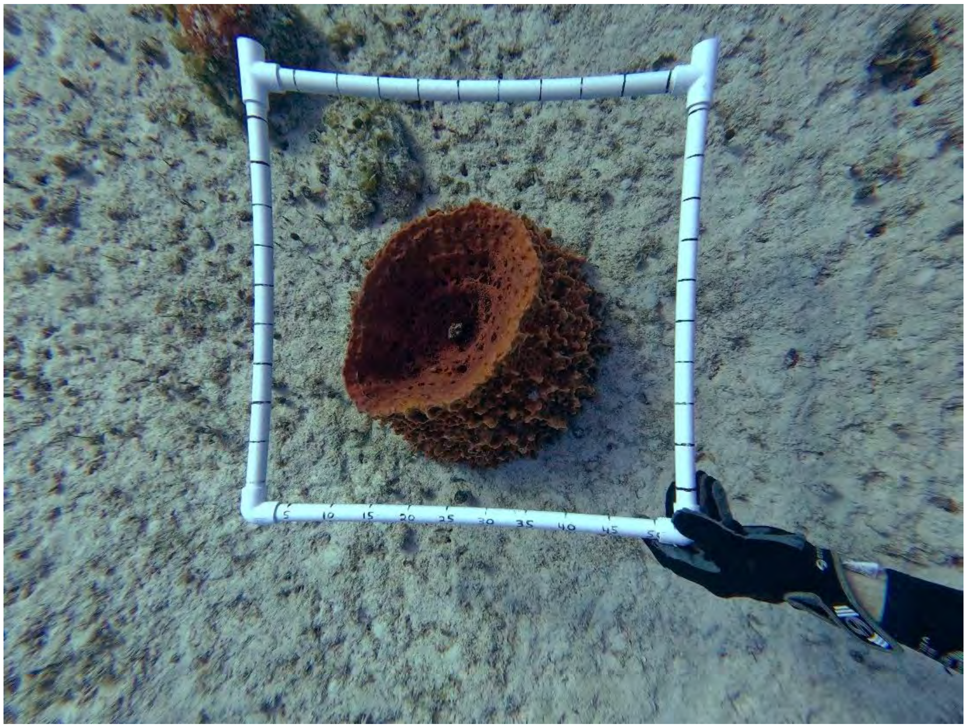
- SURVEY MARKER FOUND (STEEL/PIPE IN CONCRETE/ROCK)
- SURVEY MARKER SET (5/8" STEEL IN CONCRETE)
- SURVEY MARKER COMPUTED (NOT SET)
- Approx. HWM — APPROXIMATE HIGH WATER MARK (NOV. 2022)

SCHEDULE OF AREAS

CROWN LAND	301.251 acres
SALINAS & POND	77.417 acres
PRIVATE LAND	382.183 acres
ROAD RESERVATION	3.861 acres
TOTAL	764.712 acres

Appendix I

Additional Site Photos



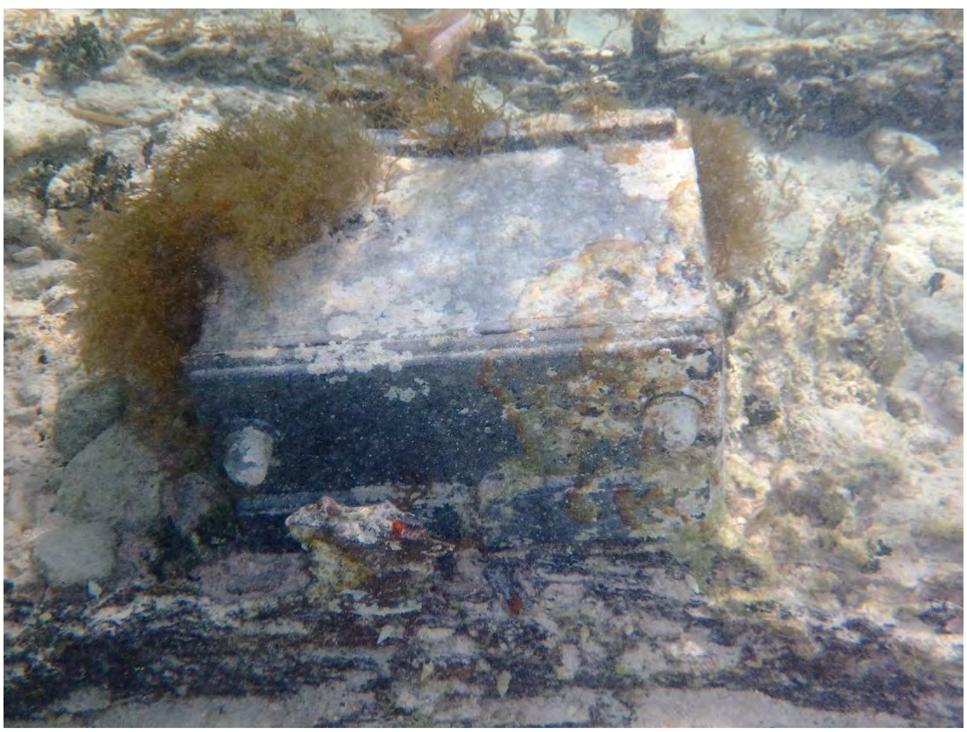
Xesto Sponge

Partially Bleached *Montastrea cavernosa*

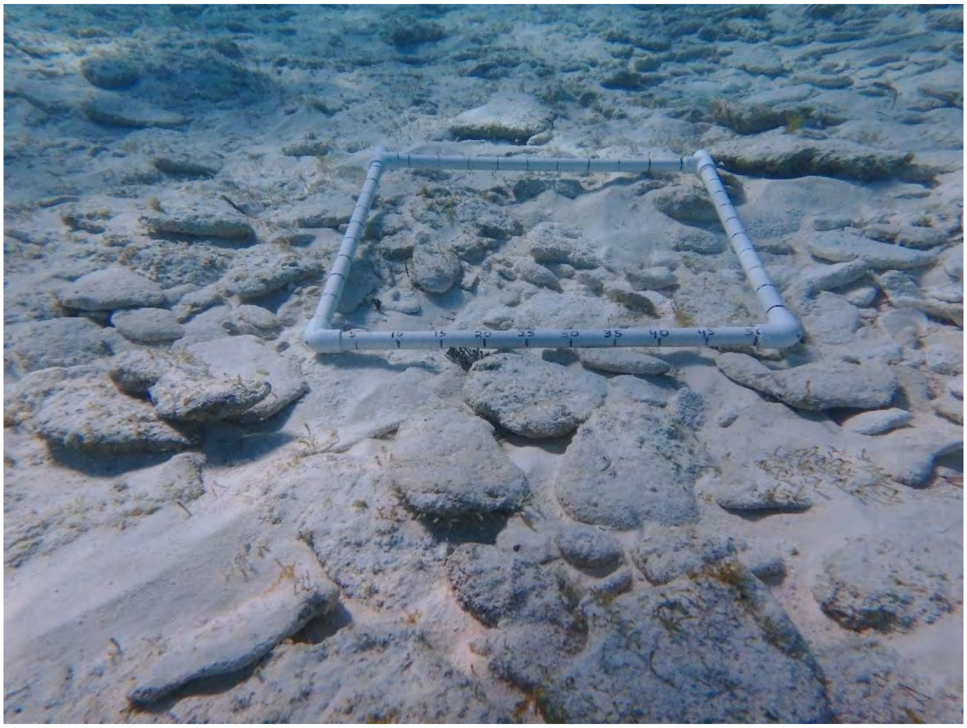
Mostly Dead Brain Coral

Floating Plastic and Drift Sargassum

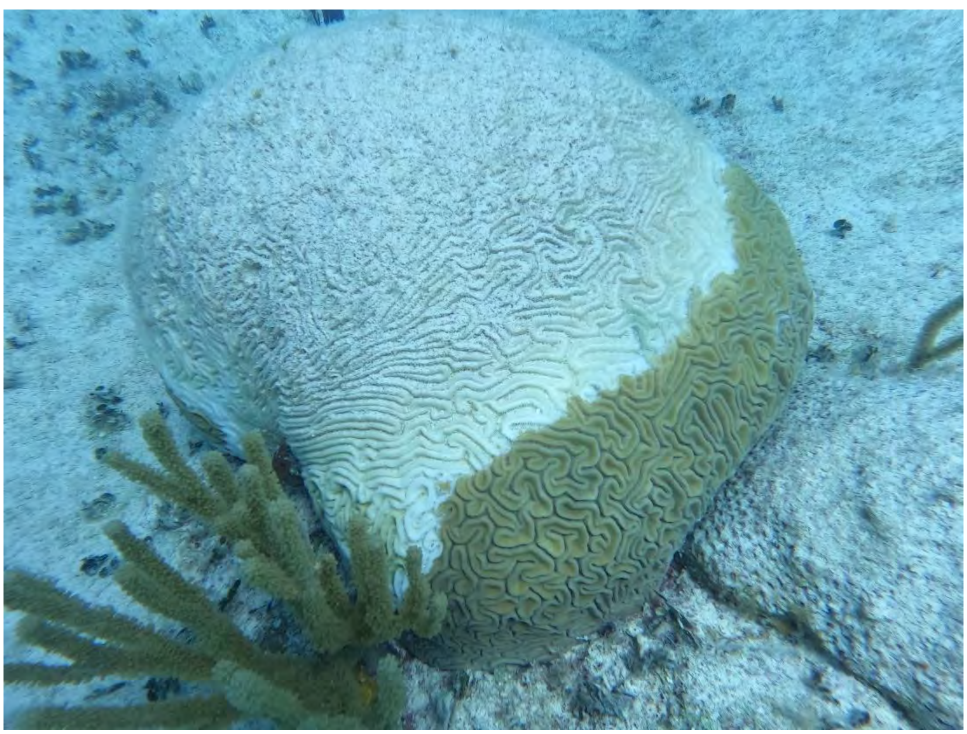
Diseased *Siderastrea* and Tattered Sea Fans



Battery and Other Debris from Sunken Boat

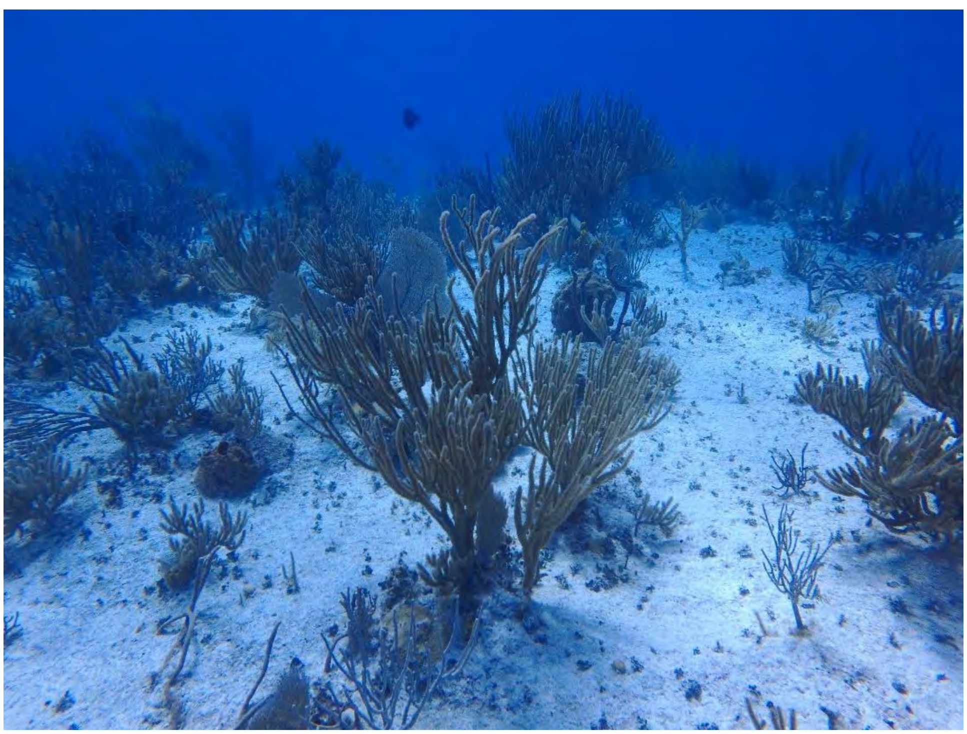


Rubble with Minimal Algae



Partially Bleached Brain Coral

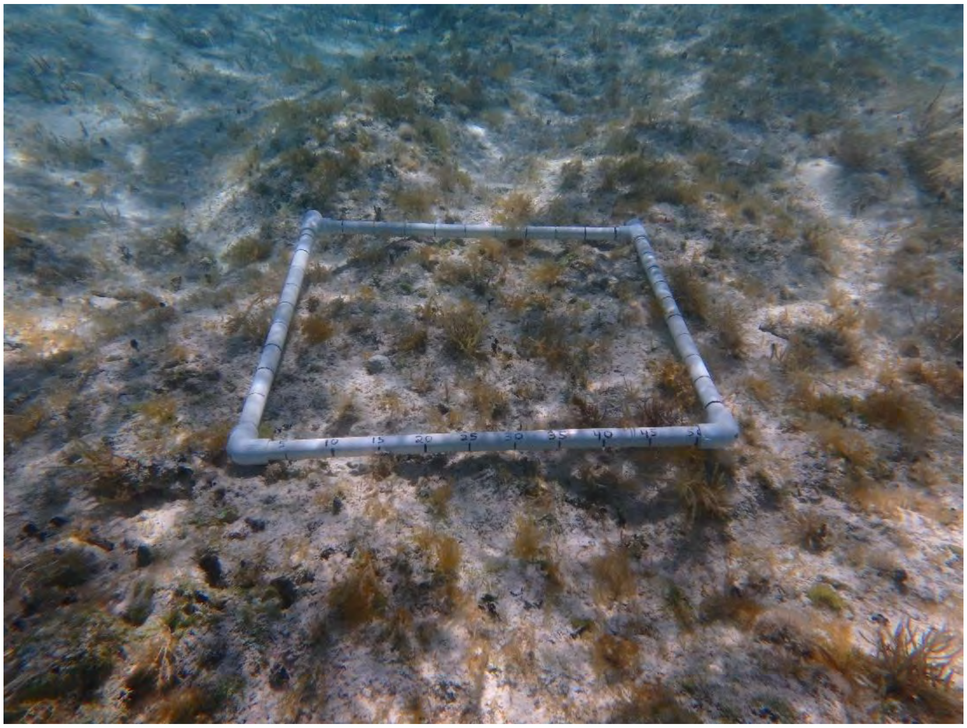
Octocoral-Dominated Hardbottom



Octocoral-Dominated Hardbottom

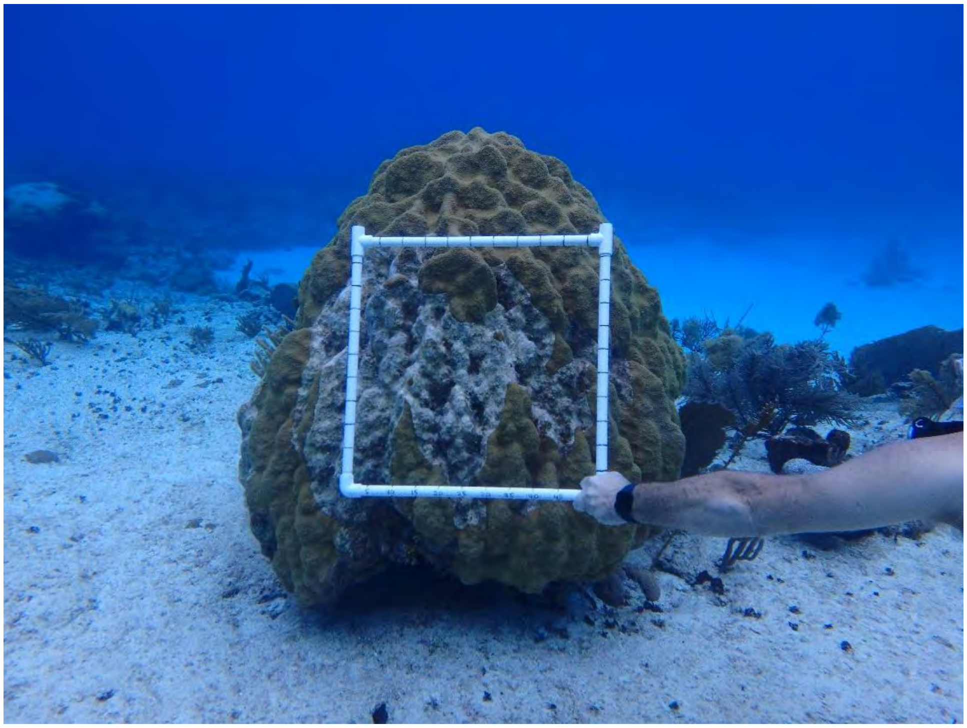
Lobster Trap

High Relief Reef



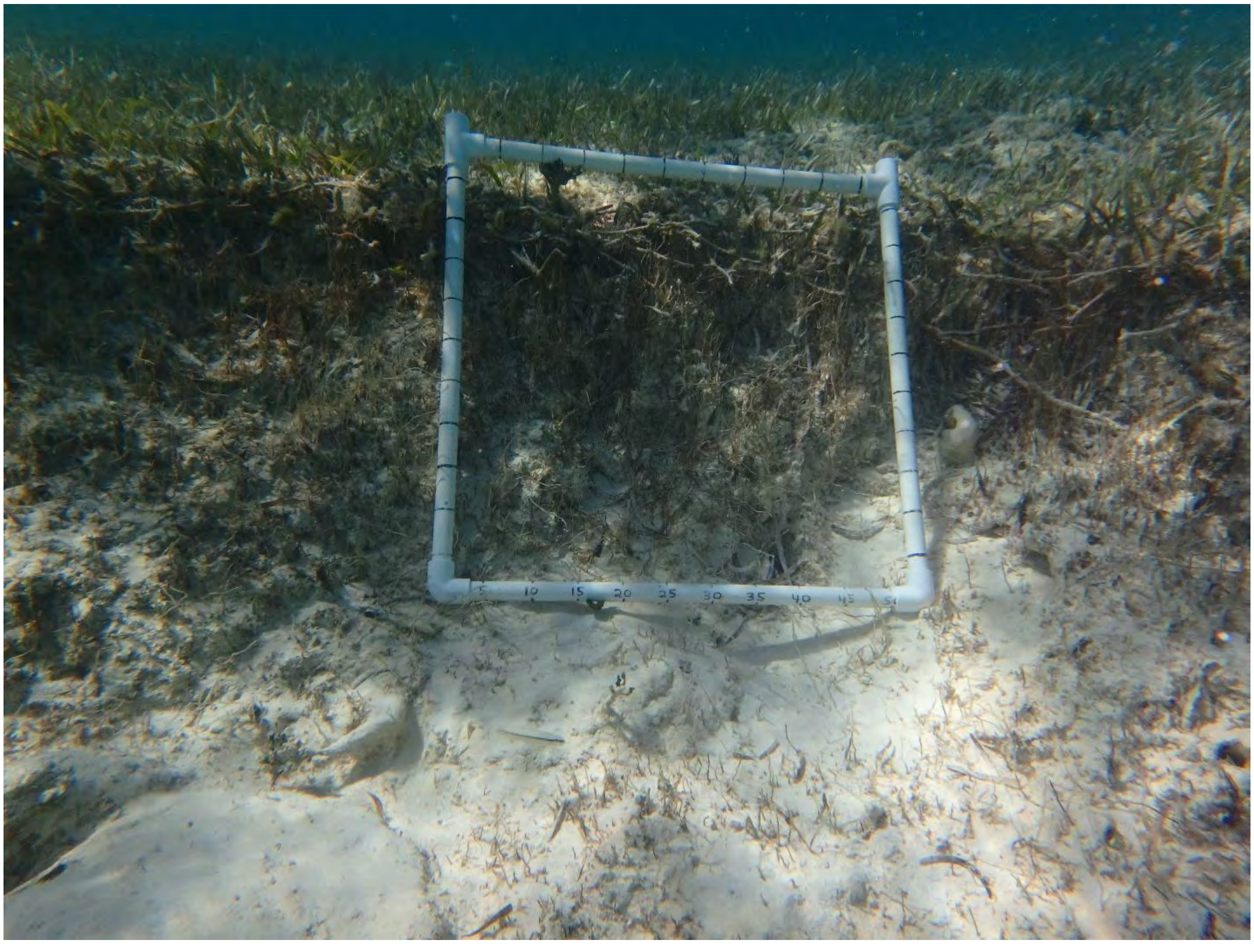
Hardbottom with Moderate Macroalgae

Green Turtle on High Relief Reef



Diseased *Orbicella faveolata*

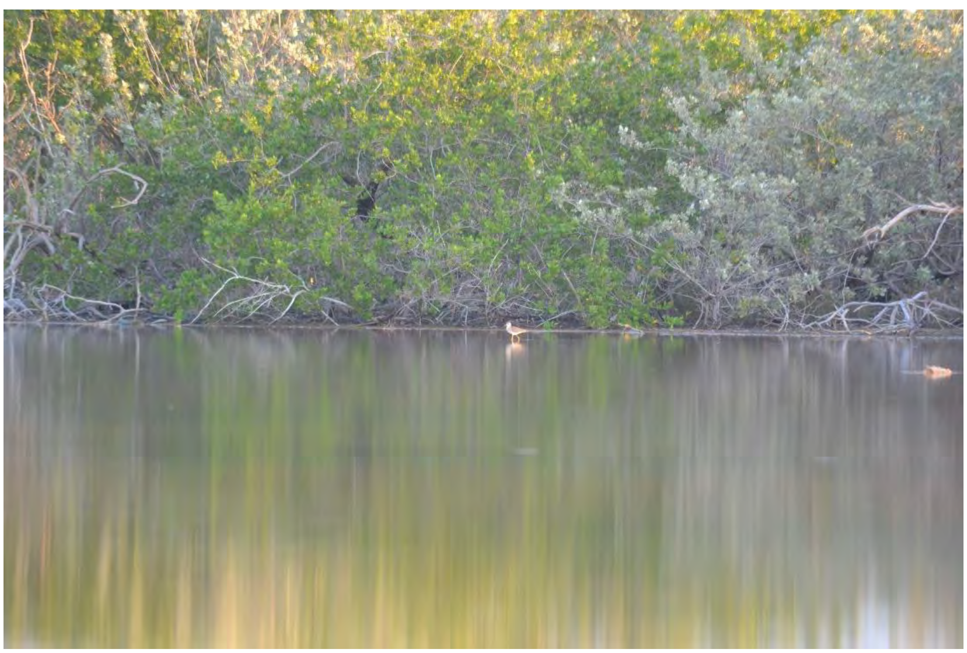
Elliptical Star Coral - *Dichocoenia stokesii* – Protected



Eroded Edge of Grassbed

Tillandsia utricultata Airplant

Old Rock Wall Abutting Unpaved Road



Yellowlegs near Shore in Northeast Salina

Juvenile Night Heron in Southern Part of Largest Salina

Wilson's Plover

Osprey Nest on Coastal Rock Promontory along Southeast Shore

Unoccupied Bird Nest near South End of Largest Salina

Blackback Land Crab – *Gecarcinus lateralis*

Coastal Rock Feature along Southeast Coastline

Encyclia Orchid

Killdeer along Shore of Salina

Rock Wall along a Property Line, Being Reclaimed by Dry Broadleaf Evergreen Forest,
View Looking Northeast

Argiope argentata Spider

Consolea nashii Cactus

Bursera frenningae

Cactus and Blooming Airplant

Encyclia Orchids

Former Landing Strip, Recently Resurfaced, View Looking East-Southeast

Litter-Strewn Beach in Folley Bay

Oystercatcher on Coastal Rock

Palm Warbler

Potential Seabird Nests along Steep Southeast-Facing Shoreline

Rhachicallis on Coastal Rock, Along Southeast Coastline, View Looking Southwest

Rhachicallis on Wide Coastal Rock along Southeast Coastline, View Looking South

Ruddy Turnstones on Coastal Rock

Southeast Shore of Largest Salina, View Looking North

Steep Coastal Rock Bluff, Eroded, on Southeast Coastline

Heavily Eroded Shoreline along Southern Portion of West-Facing Shoreline

Tidal Creek at Low Tide, View Looking Northwest

Intertidal Chiton

Appendix J

Flushing Analysis Report

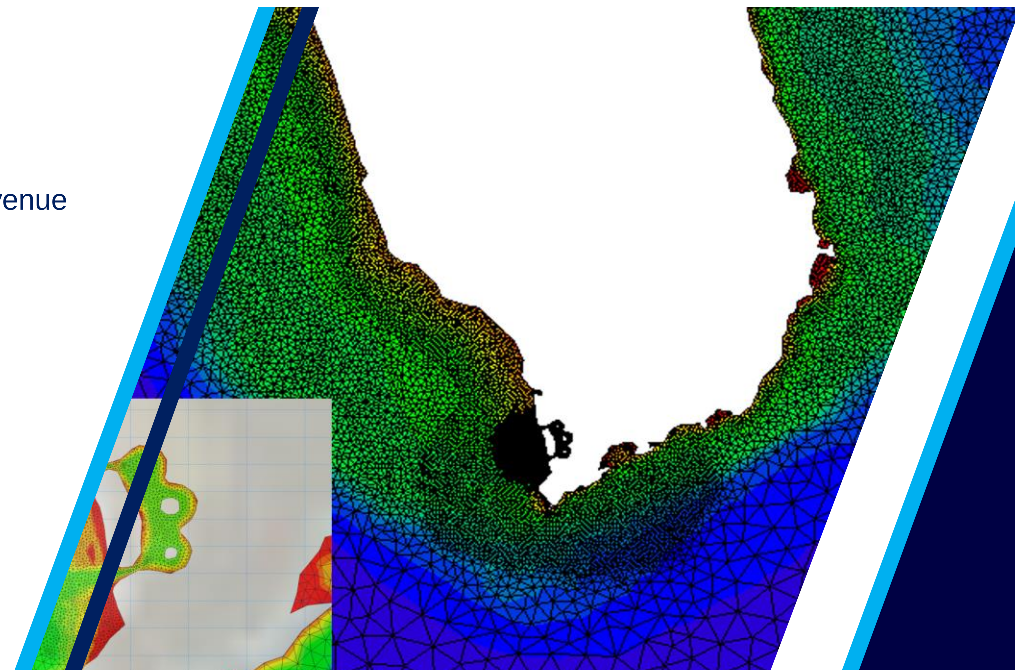
CUMMINS | CEDERBERG
Coastal & Marine Engineering

Flushing Analysis Report

Calypso Cove

Long Island, Bahamas

June 2023



Prepared for:
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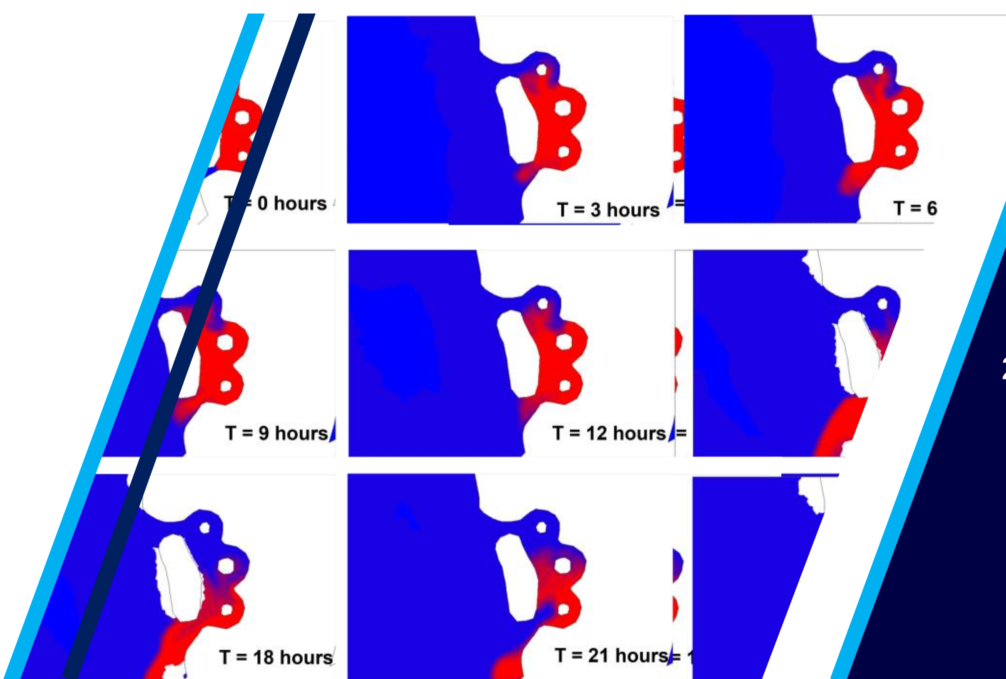
155 Shirley Park Avenue
Nassau, Bahamas



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CumminsCederberg.com

Technical Report

Flushing Analysis Report

Calypso Cove
Long Island, Bahamas

June 2023

Prepared for:

Island by Design
155 Shirley Park Avenue
Nassau, Bahamas

Prepared by:

Edwin Rajeev, Ph.D.

Jason Cummins, PE

Document Status

Version	Doc type	Reviewed by	Approved by	Date issued
V01	FINAL	Jason Cummins, PE	Jason Cummins, PE	06/30/2021

EXECUTIVE SUMMARY

Cummins Cederberg was engaged to conduct an engineering analysis relative to the water circulation and flushing of the proposed lagoon created at the Calypso Cove, located at the southern end of Long Island, The Bahamas (Project). The flushing time is the time required to exchange a percentage of water from the lagoon with the ambient area based on mixing, water circulation, tidal variations and other mechanisms.

A numerical model was established utilizing bathymetric survey data collected in the vicinity of the Project site along with regionally available bathymetric data beyond the immediate Project area. The numerical model of existing conditions was calibrated against tidal water levels and locally measured currents. The numerical model was then adapted to represent the proposed lagoon conditions. The initial plan for the lagoon was characterized by two channels connecting the new lagoon to the sea, and a water depth of approximately 8 feet. The initial flushing results were less favorable and an iterative process of modifications to the lagoon was performed to optimize the flushing time, while maintaining the design vision. Ultimately, two alternatives were examined beyond the initially proposed lagoon.

The first alternative was to reduce the depth from 8 feet to 6 feet, which resulted in a significant improvement in the flushing time to reach a dilution factor of 10%. The second alternative included widening and slightly reorientating the connecting channels, which further improved the flushing time. Overall, through iterative optimization, the flushing time to reach a dilution factor of 10% for the proposed lagoon was reduced from an initial timeframe of 96 hours to 30 hours, as outlined in the below table.

Layout	Characteristics	Flushing Time to reach 10% Dilution Factor (Hours)
0	Original Proposed Layout – 8’ depth in lagoon and channel	96
1	6' depth in lagoon and channel	48
2	6' depth in lagoon, modified channel orientation and width	30

The following conclusions were obtained based on the analysis results:

- The simulated flushing time of the initially proposed lagoon based on a 10% dilution factor is approximately 96 hours.
- The simulated flushing time of the alternative proposed lagoon based on a 10% dilution factor is approximately 30 hours.
- The simulated dilution factor at 12 hours, 24 hours, 36 hours and 48 hours for the proposed alternative lagoon is 72%, 41%, 6%, and 0% respectively.
- The effects of wind were conservatively excluded from the simulations.
- Based on available published standards for flushing and the simulation results, the proposed lagoon alternative configuration appears to exhibit an acceptable flushing time.

CONTENTS

LIST OF FIGURES

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CUMMINS | CEDERBERG
Coastal & Marine Engineering

Calypso Cove

Long Island, The Bahamas

June 2023

1 INTRODUCTION

1.1 General

Cummins Cederberg was engaged to conduct an engineering analysis relative to the water circulation and flushing of the proposed lagoon created at the Calypso Cove, located at the southern end of Long Island, The Bahamas (Project).

1.2 Objective

The proposed Project includes the creation of an internal lagoon in the footprint of an existing shallow salt pond to support upland development and amenities. The primary objective of the present coastal engineering analysis is to evaluate the water circulation and associated flushing characteristics of the proposed lagoon.

1.3 Scope

The scope of work included the following items:

- **Hydrodynamic Dispersion Modeling**: Cummins Cederberg developed a detailed model domain for the present flushing analysis utilizing locally collected bathymetric data along with regionally available data from other sources. Cummins Cederberg performed numerical model simulations of the tidal hydrodynamics in the vicinity for the existing and proposed conditions in order to analyze the flow characteristics and ultimately flushing characteristics of the proposed lagoon and associated connecting channels. The model is based on an unstructured flexible mesh, which accommodates detailed modeling of channels in varying sizes and configurations. The dispersion module of the numerical model (MIKE21 HD FM AD) was utilized to visually simulate the exchange of water throughout the proposed basin. The flushing time to exchange the majority of the water was evaluated and compared to industry and Bahamian standards. The report presented herein was developed to document the above-described analyses.

2 SITE CONDITIONS

2.1 Project Location

The Project site is located at the southern end of Long Island, The Bahamas and includes a proposed inland lagoon adapted from an existing salt pond as illustrated in Figure 1.

FIGURE 1: PROJECT LOCATION WITH PROPOSED LAYOUT

2.2 Tides

The water levels at the site are predominately tidally driven by a semi-diurnal tide. The tidal datums in the Project region were obtained from the National Oceanic and Atmospheric Administration (NOAA) Tide Prediction for Clarence Harbor, Long Island – Station TEC4633. The peak water levels obtained are summarized in Table 1.

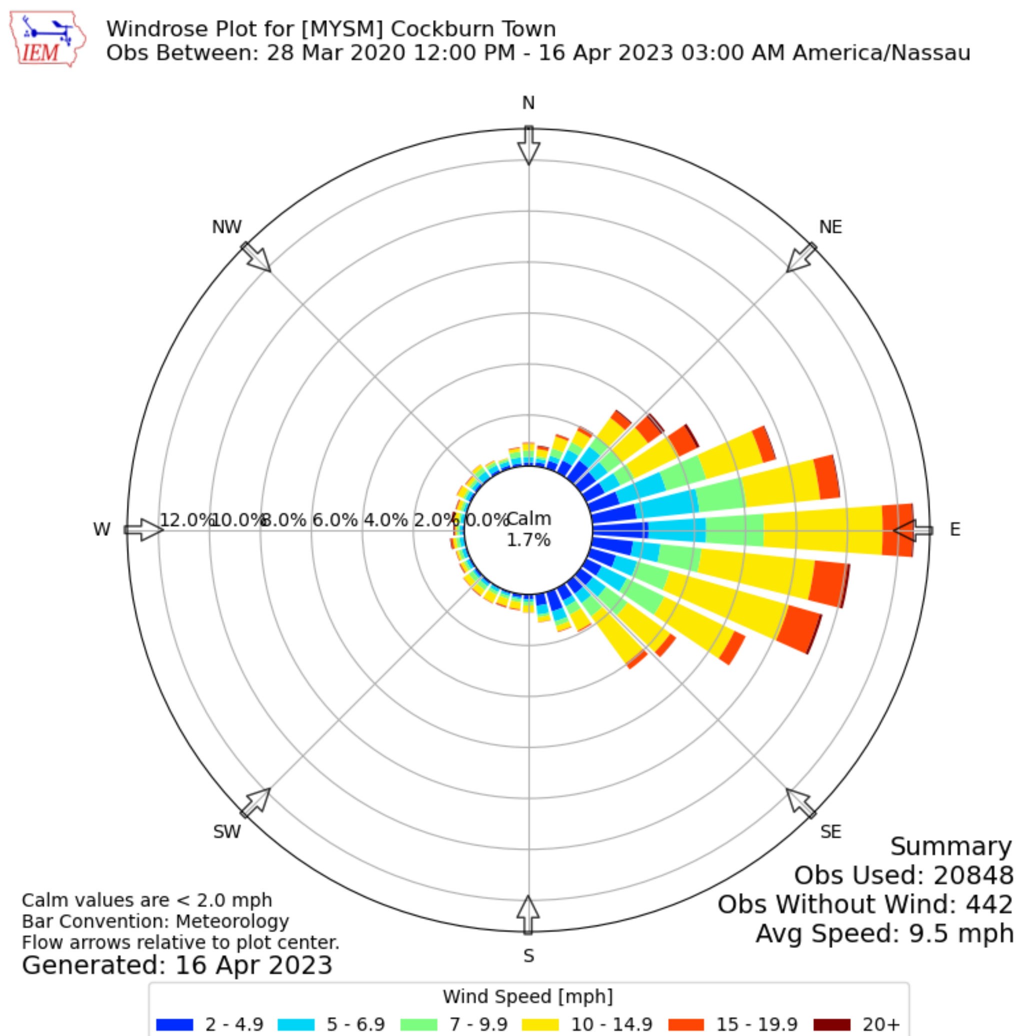
TABLE 1: TIDAL WATER LEVELS, CLARENCE HARBOR

Water Level	Elevation (m)
High Water Level	3.1 ft (0.95 m)
Low Water Level	0 ft (0 m)

2.3 Winds

A wind rose built with hourly wind data from the Cockburn Town Airport was extracted from the Iowa State University Iowa Environmental Mesonet (IEM), shown in Figure 2Error! Reference source not found.. The windrose was built off data from March 2020 to April 2023. As is typical for this part of the Caribbean, the winds in the region are predominantly from the East, with a mean wind speed of approximately 9.5 mph.

FIGURE 2: PROJECT SITE WIND ROSE



2.4 Waves

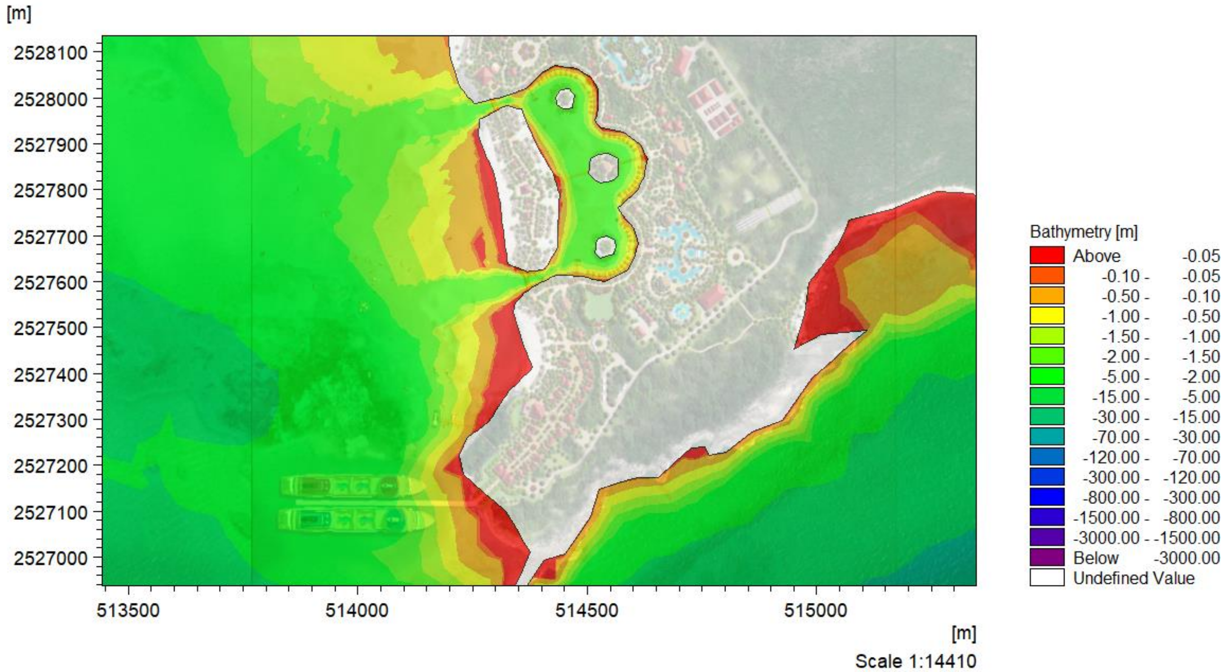
The Project site is exposed to both offshore waves and locally generated waves by the wind. The longer period swells would generally originate from the East of the Project site and to a lesser extent the south. However, due to the west facing orientation of the lagoon and openings, the approaching swells are disrupted by the southern peninsula and nearby shallow water of Long

Island. Wind generated waves may approach the site from the West, but the wind occurrence from this direction occurs with low frequency as exhibited in the prior Section.

2.5 Bathymetry

Bathymetric data was provided from a local survey for the region west and south of the Project site. Available regional bathymetric data was used to supplement the model domain areas outside the survey limits. A representation of the bathymetry in the model domain at the proposed Project site is shown in Figure 3.

FIGURE 3: PROJECT BATHYMETRY



3 FLUSHING

Flushing is an important characteristic of natural and artificial tidal lagoons. Appropriate flushing promotes water quality as well as improves the water's environmental and recreational aspects. For tidal water bodies, the potential for good water quality is typically assessed through the evaluation of the flushing time. The flushing time is the time required to exchange a percentage of water from the water body with the ambient area based on mixing, water circulation, tidal variations, and other mechanisms. Short flushing times are desirable in the water body since it reduces the potential for stagnant water and the concentrations of contaminants that might enter the water body via stormwater runoff or other avenues, thus supporting improved water quality.

3.1 Flushing Time

Values for the recommended flushing time vary based on the defining entity. The Bahamas Department of Environmental Planning and Protection (DEPP) generally states new marinas should strive for a flushing time of 90% within 24 hours. The U.S. Environmental Protection Agency (EPA) defines the flushing time as the time to reduce a concentration to 10% of its original concentration. In Florida, a flushing time of less than 4 days to reach a dilution factor of 10% is typically required by environmental agencies. Mangor defines the flushing time as the time to reduce a concentration to 50% of its original concentration and states a flushing time of 5-7 days is generally acceptable for swimming in artificial lagoons.

3.2 Hydrodynamic Model

To analyze the flushing time, a hydrodynamic numerical model was developed utilizing the MIKE21 Hydrodynamic Model (HD) engineering software package. The MIKE21 HD numerical model simulates two-dimensional water level variations and flows in response to a variety of forcing mechanisms in canals, lakes, estuaries and coastal areas. In the aforementioned hydrodynamic model, the water levels and flows are resolved on a flexible triangular grid covering the area of interest when provided with bathymetry, bed resistance coefficients, wind field, and hydrographic boundary conditions. The output of the numerical model includes a time series of water surface elevation, flux, current velocity, and directions at specified grid points.

3.2.1 Model Setup

To resolve the currents and water levels in the region of the Project site, a regional computational mesh was established. The regional computational mesh utilized in the hydrodynamic model was an unstructured flexible mesh measuring approximately 5,000 km in the East-West direction and 3,400 km in the North-South direction. The computational mesh was bounded by the Atlantic Ocean to the West and a portion of North and Central America to the West, and Central and South America to the South. To optimize the numerical model performance, the computational mesh resolution was set to vary spatially around the model domain, with increasing mesh resolution starting at 2,500,000,000 m^2 in the Atlantic Ocean and the Gulf of Mexico increasing to 250,000 m^2 in the Project Vicinity.

To reduce the computational time whilst increasing the model resolution, a nested computational mesh was developed. The nested computational mesh measured approximately 30 km in the East-West direction and 20 km in the North-South direction. The nested computational mesh at the North, East, West, and South of the computational mesh was bounded by deep water. The nested computational mesh also used an unstructured mesh and was set to vary spatially within the model domain, with increasing resolutions starting at 250,000 m^2 increasing to 15 m^2 at the Project site.

Figure 4 displays the domain for the regional computational mesh and Figure 5 displays the domain for the nested computational mesh.

The increase in the computational mesh resolution was set to be within a maximum order of magnitude change of 10. Based on available software guidance, the order of magnitude change for the transition of mesh area size should range from 4 to 10 (DHI, 2021a).

The regional computational mesh was defined with an open boundary to the North and East adjacent to the Atlantic Ocean. At the boundary, water levels were selected as input for the numerical model. The water level data was obtained from the MIKE 21 Global Tide Model (GTM). The GTM provides data for the tidal prediction of water levels derived from 17 years of multi-mission satellite altimeter data, validated with coastal tide gauges around the globe (DHI, 2017).

The nested computational mesh was defined with a Flather boundary condition at the North, South, East, and West extents of the domain. The Flather boundary condition utilizes the velocity components and water level as input, values which were extracted from the regional hydrodynamic models.

FIGURE 4: REGIONAL COMPUTATIONAL MODEL

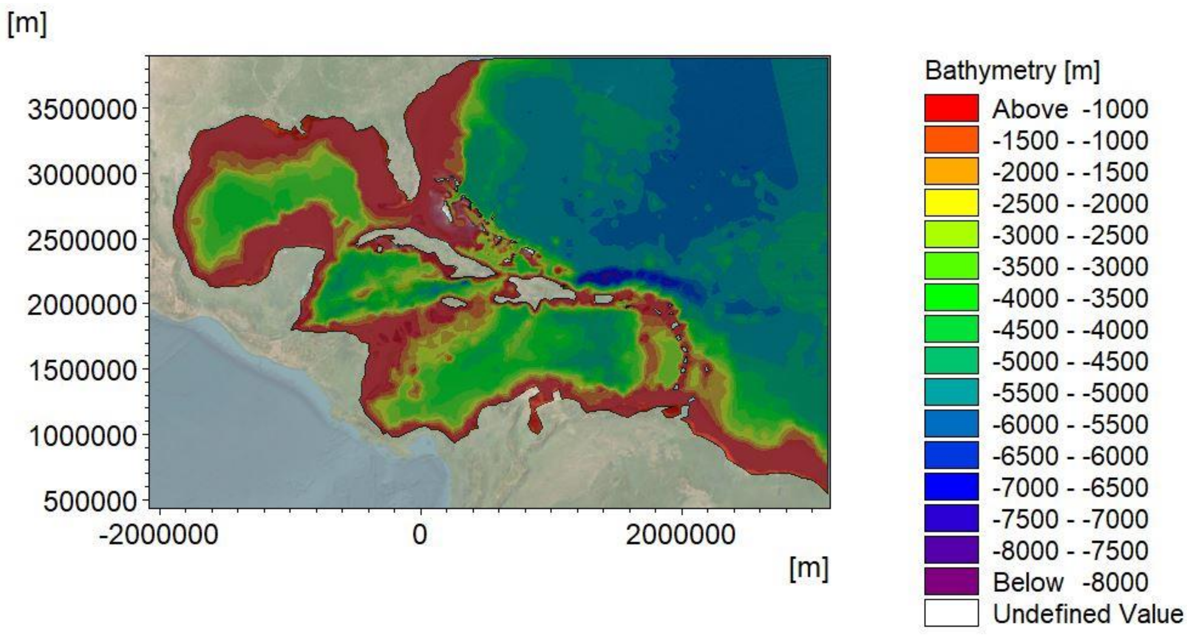
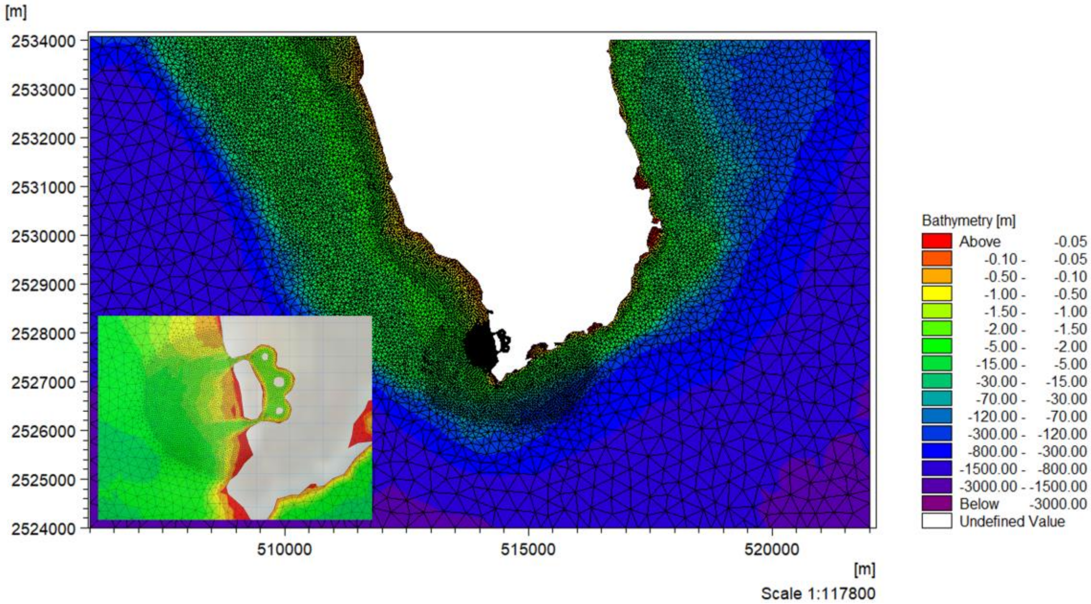


FIGURE 5: NESTED COMPUTATIONAL MESH



3.2.2 Existing Conditions and Calibration

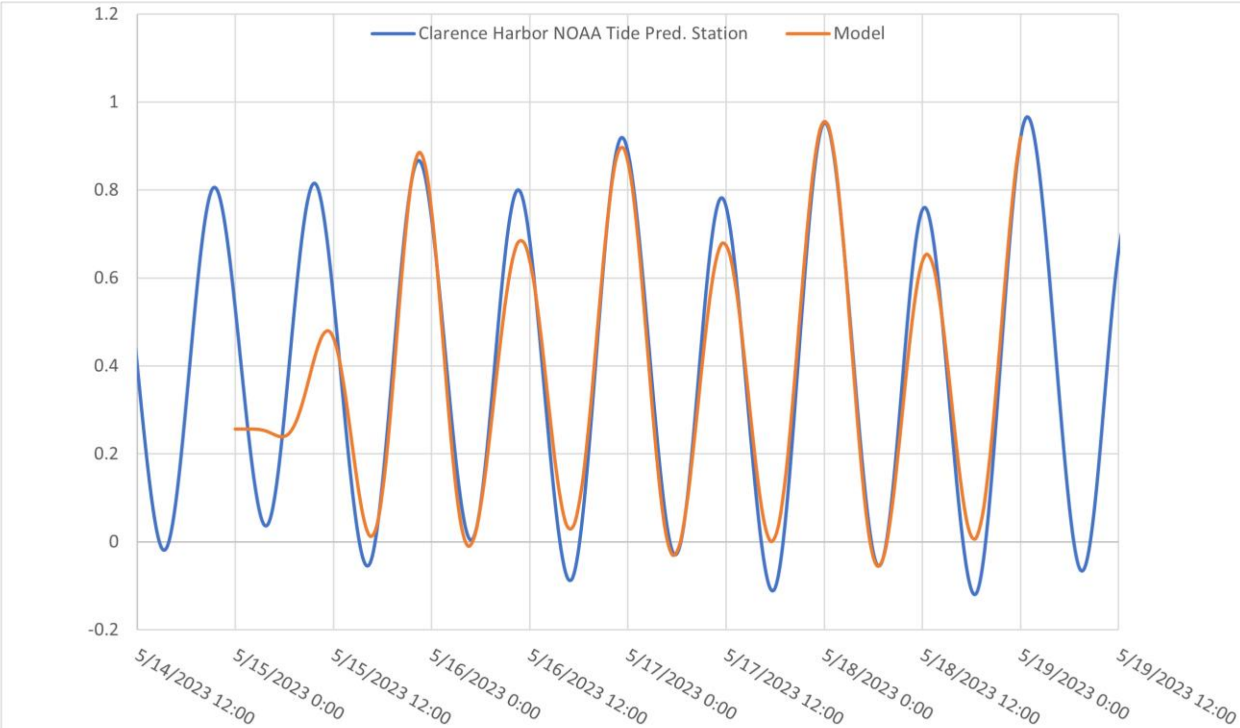
The calibration processes are discussed in the following sub-sections. The performance of the numerical model was evaluated based on the comparison between the predicted and simulated water levels.

3.2.2.1 Water Level Calibration

Prior to the flushing analysis, a comparison between the predicted and simulated water levels was conducted to calibrate the model for existing conditions. The calibration of the hydrodynamic model was conducted by adjusting the boundary condition, the refinement of bed resistance, and the refinement of the computational mesh.

Tide prediction data was extracted from NOAA's Center for Operational Oceanographic Products and Services (CO-OPS) tidal station near the Project site. The NOAA tide station at Clarence Harbor, Long Island – Station TEC4633 was selected as the reference station to verify the accuracy of the water levels simulated by the numerical model. Hydrodynamic simulations were carried out, and the water level elevations were extracted near the station location. The boundary water levels were scaled and shifted to match the selected vertical datum used for the project (MLLW). The numerical model appears to be in general agreement with the water level calibration data shown in Figure 6; the water levels match the tidal amplitude and phase for the selected time frame.

FIGURE 6: WATER LEVEL CALIBRATION



3.2.3 Proposed Conditions

The proposed Project involves constructing an inland lagoon spanning approximately 1,000 feet of shoreline. The lagoon design features two navigation channels, each with a maximum width of around 65 feet (20 meters) and a length of 330 feet (100 meters). Inside the lagoon and channels, the water depth was set at 8 feet (2.4 meters) above mean sea level (MSL), with the channels extended to the nearest contour of the same water depth. To simulate the hydrodynamics of the proposed marina installation, the digitized layout was integrated into the existing numerical model. Figure 7 provides a visual representation of the proposed lagoon.

FIGURE 7: PROPOSED LAGOON LAYOUT

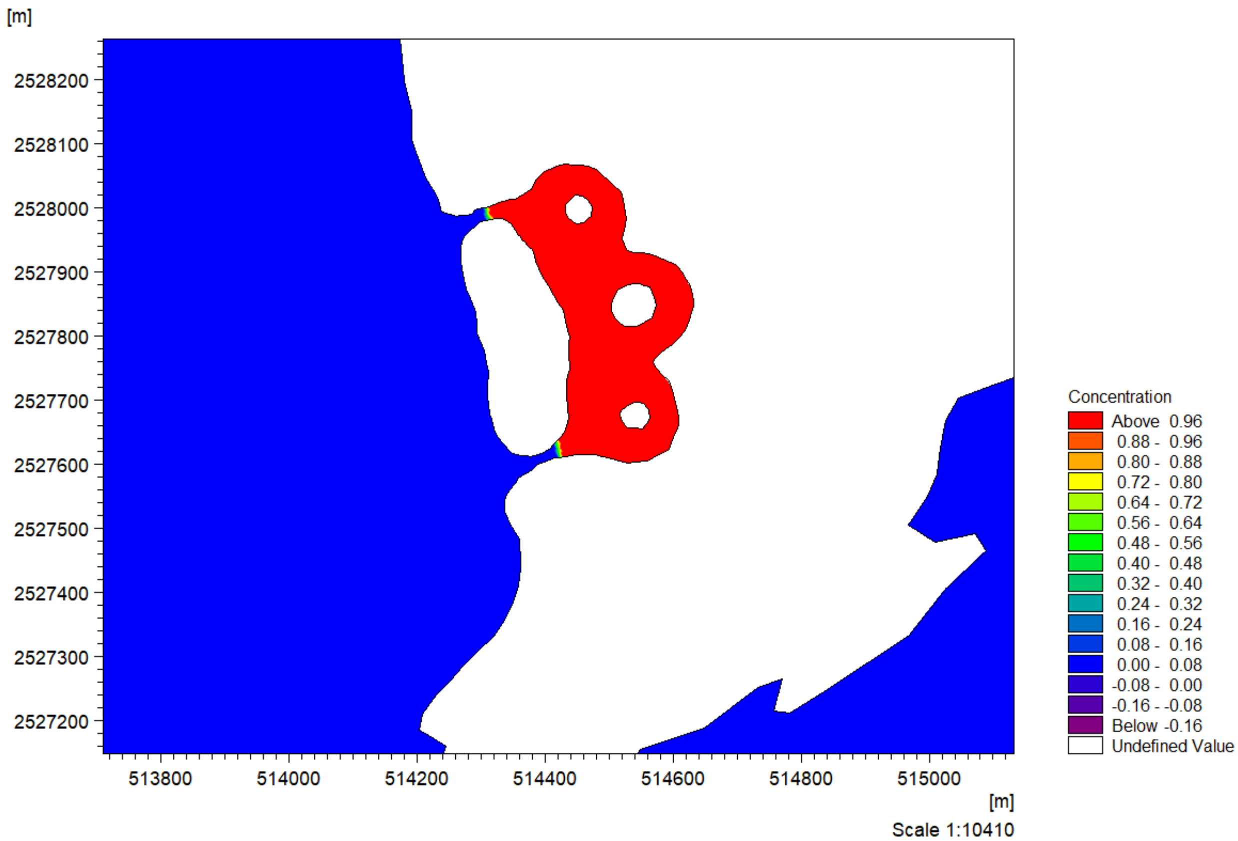
3.2.4 Transport Module

The Transport module of the MIKE21 HD FM model simulates the transport of suspended substances based on the flow conditions from the hydrodynamic calculations. In the two-dimensional simulation, described herein, the dispersion coefficient is calculated as the eddy viscosity, used in the solution of the flow equations, multiplied by a scaling factor. In a typical

MIKE21 HD FM simulation with the Transport module, the substance concentrations are resolved on a flexible triangular grid covering the area of interest, when provided with the inputs to the hydrodynamic model, initial concentration and decay characteristics, along with boundary conditions. The output of the Transport module includes a time series of substance concentrations and current velocities at all specified grid points.

For the proposed conditions, a dye area of approximately 17.9 acres (72,577 m^2) was placed throughout the proposed lagoon. The initial conditions for the transport model are shown in Figure 8**.**

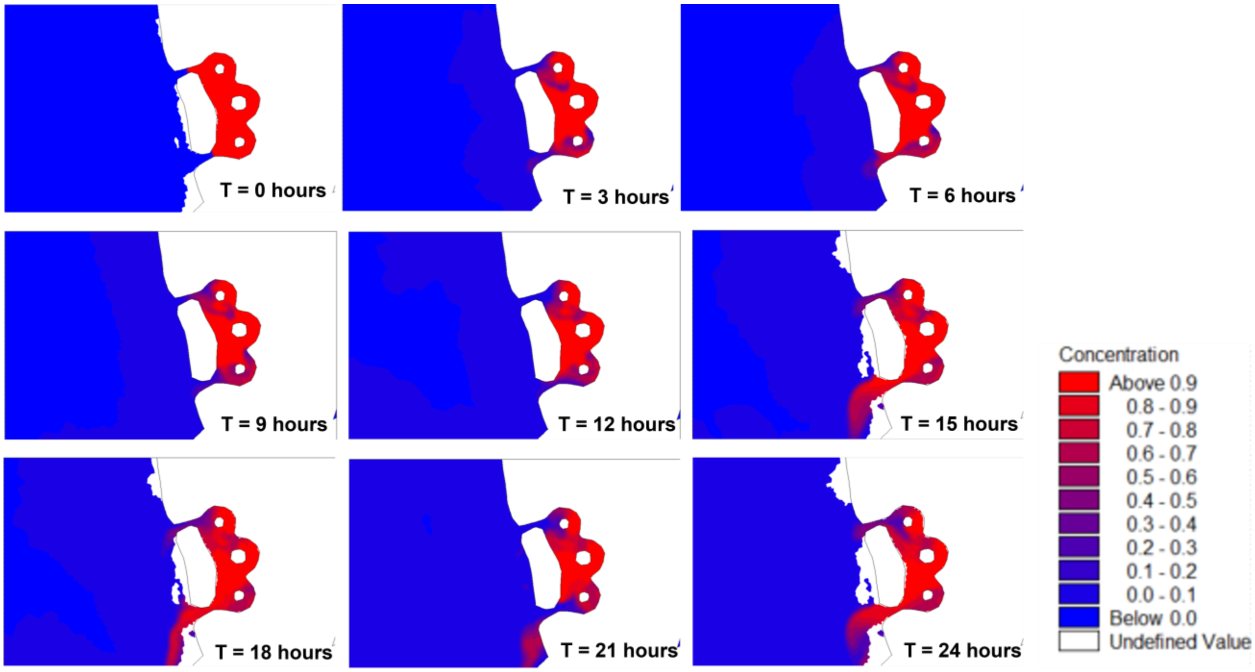
FIGURE 8: INITIAL CONDITIONS MAP FOR PROPOSED CONDITIONS



3.2.5 Results and Discussion

The model results of the proposed lagoon indicate the flushing time to reach a dilution factor of 10% requires 96 hours. The north and south navigation channels, each 65 feet (20 meters) wide, directly connect the lagoon to the Atlantic Ocean, allowing water to enter the basin during flood tide and exit during ebb tide. It's important to note that the model simulations conservatively did not consider the effect of wind, which may support increased circulation and a decrease in the flushing time to reach a specified dilution factor. Figure 9 exhibits the achieved dilution at various time steps during the model simulations.

FIGURE 9: PROPOSED CONDITIONS FLUSHING RESULTS



In an effort to improve the flushing characteristics of the proposed lagoon, alternatives were considered in an iterative approach.

3.2.5.1 Alternative Configurations

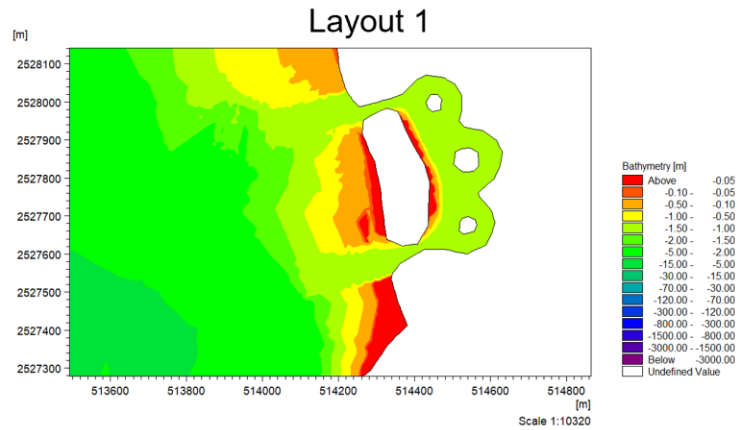
The proposed alterative layouts were sequentially assessed via model simulation in an iterative approach to achieve improved flushing:

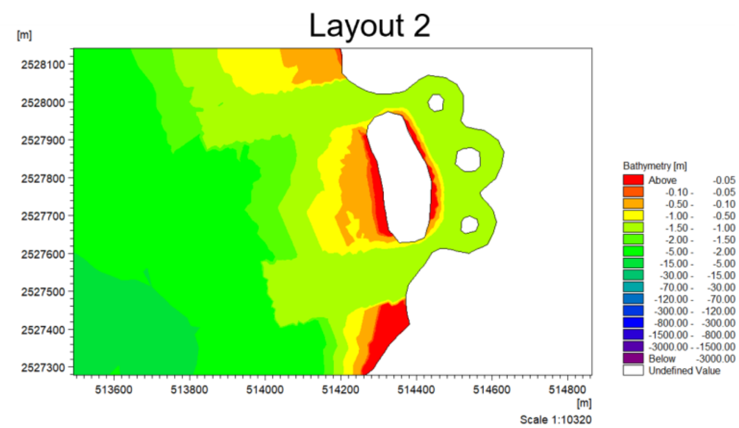
- Layout 1: This layout involves reducing the water depth in both the lagoon and channels from 8 feet to 6 feet below the Mean Lower Low Water (MLLW) level.

- Layout 2: In addition to reducing the water depth in the lagoon and channel to 6 feet below MLLW, this layout increases the widths of the connecting channels from 65 feet to 130 feet and slightly modifies the alignment.

Figure 10 illustrates the two proposed alternative layouts.

FIGURE 10: ALTERNATIVE LAYOUTS





In Layout 1 the volume of water within the lagoon was reduced by 25% through a decrease in water depth, and the flushing times noticeably improved. The results showed a 50% reduction in flushing time, with the dilution reaching 10% of its initial concentration within 48 hours. Figure 11exhibits the achieved dilution at various time steps during the model simulations for Layout 1.

Layout 2 introduced wider connecting channels adjustment in the orientation. These changes resulted in a further reduced flushing time of 30 hours to achieve a dilution factor of 10%. **Error! Reference source not found.** exhibits the achieved dilution at various time steps during the model simulations for Layout 2.

Table 2 outlines the flushing times for each layout, indicating the time required for the concentration within the channel to reach 10% of its initial value. This information serves as a quantitative measure of the flushing efficiency achieved by each layout compared to the original design.

These results indicate that modifying the lagoon layout can significantly improve the flushing rate and dilution of contaminants. By implementing the adjustments suggested in Layouts 1, 2, and 3, it is possible to achieve a more efficient hydrodynamic performance and ensure compliance with acceptable standards for flushing set by DEPP.

FIGURE 11: LAYOUT 1 FLUSHING RESULTS

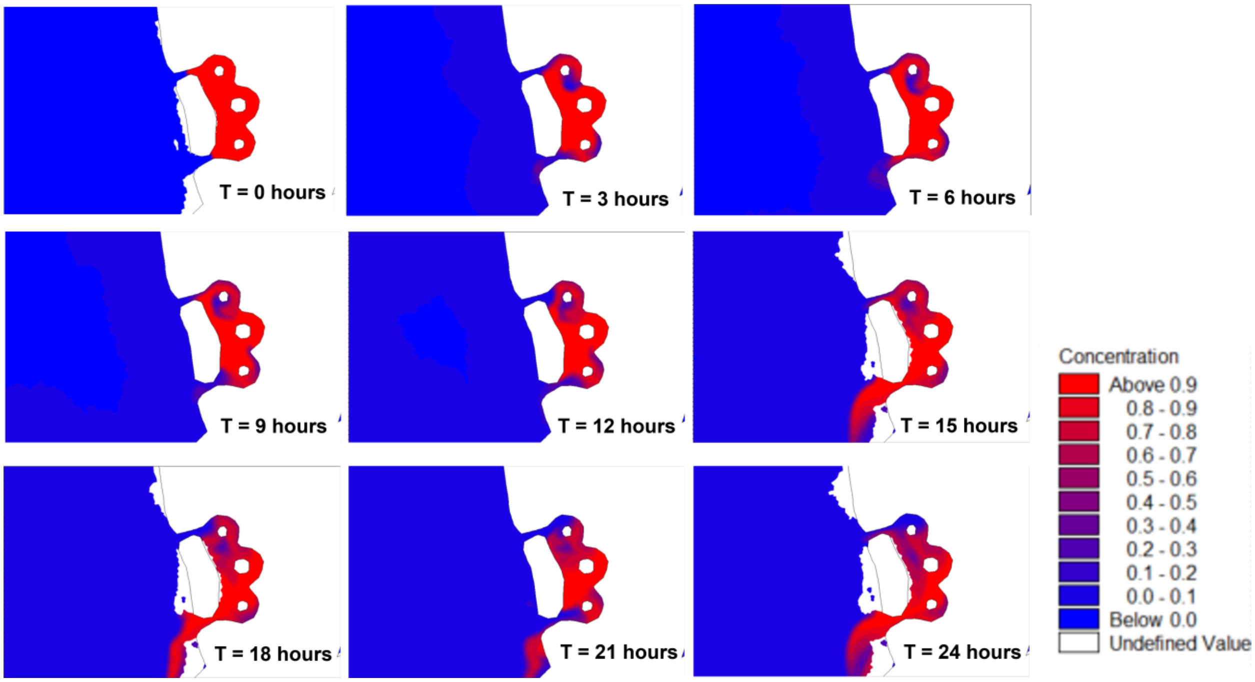


FIGURE 12: LAYOUT 2 FLUSHING RESULTS

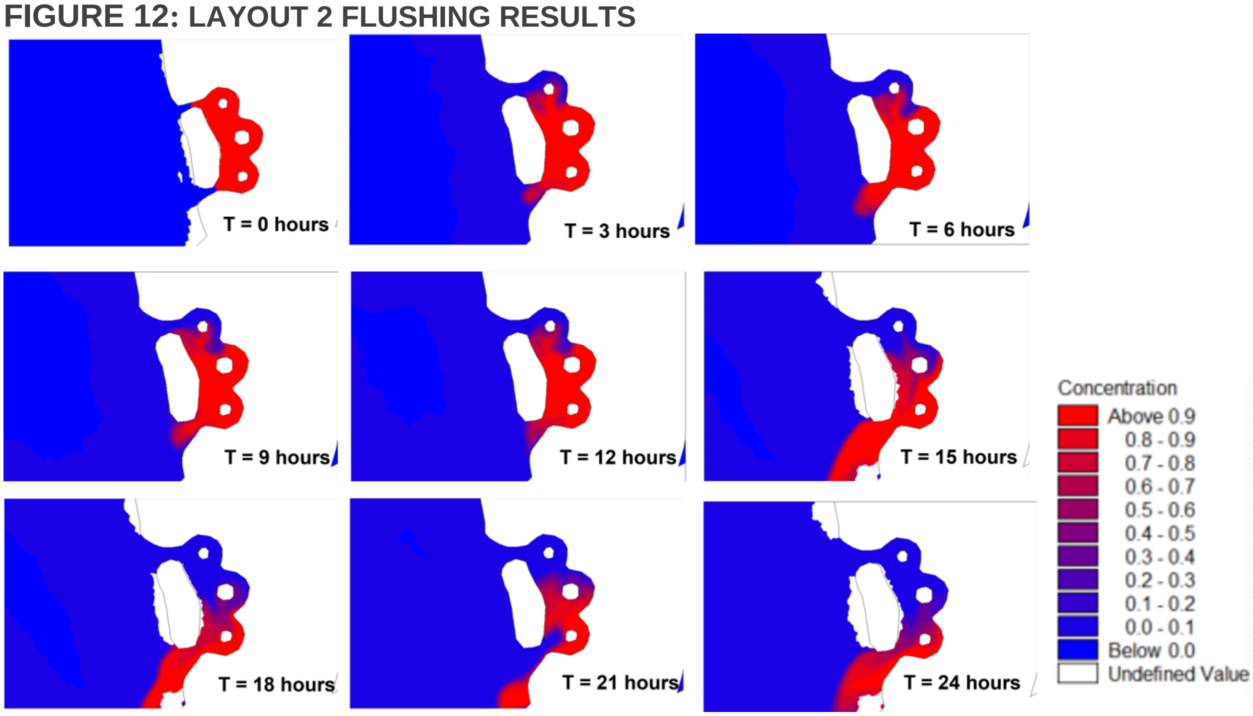


TABLE 2: FLUSHING TIMES FOR LAYOUTS

Layout	Characteristics	Total Flushing Time (Hours)
0	Original Proposed Layout – 8' depth in lagoon and channel	96
1	6' depth in lagoon and channel	48
2	6' depth in lagoon, channel and modified channel orientation and width	30

4 CONCLUSIONS

Numerical model simulations were conducted to evaluate flushing characteristics of the proposed lagoon at the Project. The initial plan for the lagoon was characterized by two channels connecting the new lagoon to the sea, and a water depth of approximately 8 feet. Two alternatives were examined beyond the initially proposed lagoon. The first alternative was to reduce the depth from 8 feet to 6 feet, which resulted in a significant improvement in the flushing time. The second alternative included widening and slightly reorientating the connecting channels, which further improved the flushing time. The following conclusions were obtained based on the analysis results:

- The simulated flushing time of the initially proposed lagoon based on a 10% dilution factor is approximately 96 hours.
- The simulated flushing time of the first lagoon alternative based on a 10% dilution factor is approximately 48 hours.
- The simulated flushing time of the second lagoon alternative based on a 10% dilution factor is approximately 30 hours.
- The simulated dilution factor at 12 hours, 24 hours, 36 hours and 48 hours for the proposed alternative lagoon is 72%, 41%, 6%, and 0% respectively.
- The effects of wind were conservatively excluded from the simulations.
- Overall, through iterative optimization, the flushing time to reach a dilution factor of 10% for the proposed lagoon was reduced from an initial timeframe of 96 hours to 30 hours.
- Based on available published standards for flushing and the simulation results, the proposed lagoon alternative configuration appears to exhibit an acceptable flushing time.

This report was prepared in accordance with industry standards and practice for the exclusive use in the design for Calypso Cove at Long Island, The Bahamas. Cummins Cederberg should be consulted if the design or site conditions change. The services performed by Cummins Cederberg are consistent with the degree of care and skill ordinarily exercised by and consistent with the standards of the engineering profession practicing at the same time, under similar circumstances and in the same or a similar location as the Project. No other warranty, express or implied, is herewith made.

5 REFERENCES

1. DHI Water & Environment, MIKE 21 Flow Model FM Hydrodynamic, User Guide (2021a)

2. DHI Water & Environment, MIKE 21 Flow Model FM Transport Module, User Guide (2021b)

3. United States Environmental Protection Agency, "Coastal Marinas Assessment Handbook" (1985)

4. Mangor, Karsten, "General Guidelines for Good Quality Artificial Beaches and Lagoons, and Case Stories" (2007)

Appendix K

Palm Villa Historical Profile

Palm Villa Development
Historical Heritage Profile

BY: THE HERITAGE PARTNERS

SUBMITTED: JULY 4, 2023

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1. ABSTRACT

This Historical Heritage Profile concerns an assessment of several historical/heritage structures located on property earmarked for commercial development in Gordons, Long Island, The Bahamas. It considers the general history of the Gordons settlement and the wider history of Long Island. It also undertakes the genealogical tracing of an individual's ancestral history.

2. INTRODUCTION

Long Island, one of a considerable number of populated islands in the Commonwealth of The Bahamas, is sometimes described as a 'country of contrasts', as the island is populated with steep rocky cliffs which plunge into the ocean on its northeastern side, broad white sandy beaches on its southwestern side, as well as salt flats, swamplands, and one of the largest cave systems in the entire Bahamas.

Aside from its physical beauty, Long Island boasts a fascinating history. It has been identified as one of the islands on which Christopher Columbus made landfall during his famed 1492 voyage. Before that, the island was known as *Yuma* by its original inhabitants, the indigenous Arawak and Lucayan Taino people, who lived there until their unfortunate relocation and demise brought on by Mr. Columbus and his compatriots.

Following this, Long Island is thought to have been largely uninhabited until the mid-17th century, when a number of Loyalists from New England and New Jersey settled there after fleeing the American Revolution, and later established cotton plantations on which they furthered the slave-labour model. Ruins from those plantations (now mostly overgrown by bush) still can be found on Long Island today, as well as remains of some of the stone houses built after the abolition of slavery.

Alongside this rich history and heritage (and in many cases, in spite of) are a number of recent development projects taking place on Long Island which hold the promise of economic growth and expansion for the people of the island. At least one of these projects (the Project) is proposed to take place on the small, quaint settlement of Gordons, which is situated at the southernmost tip of the island, on a largely undeveloped stretch of land.

Gordons distinguishes itself from other settlements on Long Island by being the home of what is arguably the nicest beach on the entire island. It is otherwise a sleepy town, primarily inhabited by fishermen and farmers. According to the 2010 Census (the latest census information available to date), the population of Gordons (and the neighbouring settlement of Mortimers) was 74 persons. There were 27 occupied dwelling places, and the average household size was 2.74 persons. Due to accounts from residents, we estimate that since then, the population and number of occupied dwelling places in the settlement have decreased, perhaps significantly.

Several months ago, in connection with the Project, local labourers were tasked with clearing a path through some bush on a large plot of land in Gordons known as "Palm Villa". While doing so, they made a surprising discovery: hidden deep in the scrub were the ruins of two old stone buildings, reduced to their foundations (the Buildings). Adjacent to the Ruins they found a concrete gravestone (the Gravestone), that is inscribed as follows:

IN MEMORY OF
LOUIS P. KNOWLES JR.
BELOVED SON OF
LOUIS P. KNOWLES SR.
DIED NOV. 27, 1904
AGED 34 YEARS

There is also a low stone wall running the length of the property (the Wall).

Together, the Buildings, the Gravestone, and the Wall are referred to as the "Heritage Assets".

These discoveries precipitated the asking of several questions:

- Who was Louis P. Knowles Jr?

- What is the history of the Palm Villa property?
- What is the significance/value of the Heritage Assets?

In completing this Historical Heritage Profile, we aim to provide conclusive and satisfactory responses to each of these questions.

3. RESEARCH METHODOLOGY

Data for this assessment was obtained by conducting field studies and follow-up telephone and in-person interviews, accessing public and primary archives, birth, marriage, and death certificates, census records, official statistics and government documents (primary source data) and collecting secondary source data from the Internet and other sources which pertains to the subject matter of this report.

In order to gain the requisite insight into the perceptions of the Gordons community regarding the heritage assets in question and the history of Palm Villa, semi-structured oral interviews were conducted with a number of residents of Gordons and Mortimers. An extensive genealogical exercise was undertaken to ascertain the identity and story of Louis P. Knowles Jr.

4. HISTORICAL OVERVIEW

4.1 Long Island

An early reference to Long Island in its earliest form was made in an 1891 text called Stark's History and Guide to the Bahama Islands. The author, James Stark, described Long Island as follows:

> This island is situated about twenty miles to the eastward of little Exuma, it is fifty-seven miles long, and at the south end, which is the broadest part, three and one-half miles across; in some places it is scarcely a mile wide. This island was settled by some of the most wealthy and intelligent of the loyalists after the revolutionary war. The population of the

> island is 2,575. The inhabitants are principally employed in agriculture and stock farming; there are also salt ponds capable of being worked. After the abolishment of slavery the cotton plantations were abandoned, the land fell into the hands of small capitalists, which occasioned a decline in the prosperity of what had been known as the principal agricultural island in The Bahamas. The cultivation of sisal in connection with cotton has been attended with success, and and effort is being made to regain to some extent. The settlements are Clarencetown, Southend, Sim's and Deadman's Cay. With Ragged Island, Long Island sends two members to the House of Assembly. (Stark, 1891, 199-200)

The American Revolutionary War that Stark references, which took place from 1775 to 1783, was a conflict between Great Britain and the thirteen American colonies seeking independence. Many colonists, known as Loyalists or Tories, remained loyal to the British Crown and opposed the revolution. Long Island, located in the southeastern Bahamas, was settled by British loyalists in the late 18th century. Seeking refuge from the turmoil of the Revolutionary War, Loyalists fled the American colonies and settled in various parts of the British Empire, including the Bahamas.

The Bahamas, being a British territory, became a popular destination for Loyalists due to its proximity to the American colonies and its support for the British Crown. The Bahamas offered land grants and economic opportunities to attract settlers. One notable figure in Long Island's Loyalist history is Colonel Andrew Deveaux. A prominent Loyalist leader, Deveaux led a successful campaign against the Spanish in the Bahamas during the Revolutionary War. His efforts contributed to the protection of the islands and the establishment of Loyalist settlements, including those on Long Island. For Long Island, the Loyalists began arriving in 1784.

According to in-depth research conducted on the history of Long Island, Long Island was only "briefly touched by the arrival of American Loyalists." (Long Island Bahamas History, 2022) The research also revealed that the successful patterns of subsistence observed from 1820 through the 21st century were those developed by the "Old Inhabitants".

The term "Old Inhabitants*"* is a label given to people who were in the Bahamas prior to 1780. "Long Island was in fact occupied by some of these Old Inhabitants by at least 1776, and likely as early as 1740”. (Long Island Bahamas History, 2022) These people were described as “merchants and lawyers and shopkeepers and subsistence farmers, having a diversified economy in the Out Islands. Many had come from Bermuda - either themselves or their ancestors.” (Long Island Bahamas History, 2022) People “who were documented as being born/baptized, living, marrying, having babies, being enumerated, being taxed, and listed in wills in The Bahamas prior to 1775 are also labeled as Old Inhabitants.” (Long Island Bahamas History, 2022) The description of these people as Old Inhabitants is mostly used in modern times for research purposes - when the American Loyalists arrived they mainly looked down on them, and described them as “conchs”.

In Long Island, like other islands of The Bahamas, prior to the influx of Loyalists, original Land grants were given to persons who had already established a life in The Bahamas - apparently, over half of the land on Long Island had been granted to those people who had *not* arrived in The Bahamas as Loyalists. Despite the first set of American Loyalists migrating to The Bahamas starting in 1783, there was no official apparatus to legally award land to individuals, and it wasn't until 1788 that the British crown was able to finalize acquisitions negotiations with the Lords Proprietor.

Research also shows that Long Island had 64 American Loyalist land grantees, and there were 90 Old Inhabitants and 32 heads of household with an *old family name*. The meaning of *old family name* in the cited work means “If a grantee surname was present in Bahamian records predating 1780, but we could not match the given/first name of the grantee to old records.” (Long Island Bahamas History, 2022)

According to Bahamian Historian and Archaeologist Dr. Grace Turner, the land grant mechanism led to social changes which impacted the African population of The Bahamas and Long Island in particular. Although free blacks (as opposed to those Africans who were enslaved during this period) did not generally benefit from land grants, they participated in migration to islands such as Long Island, where it was noted that there were 21 “families of colour” in 1788, as compared to one free born mulatto and one manumitted person reported for Long Island in 1782. It is suggested that this migration by free blacks out of Nassau to Long Island may have been linked to a desire to avoid Loyalist harassment. (Turner, 2013)

4.2 Gordons Settlement

Gordons settlement is located on the most southern tip of Long Island, The Bahamas. It is said that the history of the settlement can be traced back to July 7th 1790, when James Butler received 660 acres of land in Gordons area. It was bounded by the land of William Thompson, the sea, and vacant land." (Long Island Bahamas History, n.d.) The Butler surname is found in numerous early records in The Bahamas, including the 1731 Woodes Rodgers' census of Nassau which would make that family Old Inhabitants as described earlier.

William Thompson is another individual who is documented to have received a grant of 580 acres in Gordons. There is evidence that the Thompson family was present in The Bahamas since 1722, and it is presumed that William Thompson is from a family of Old Inhabitants and not Loyalists. (Long Island Bahamas History, n.d.)

As part of the genealogical exercise we conducted on the Watson family (see section 5.1 below) we became aware of a Thompson woman who could *possibly* belong to the family of William Thompson. Malvina Matilda (Thompson) Watson was the wife of Bruce Watson. She was born on July 12, 1854 in Long Island, Bahamas to James Alexander Thompson and Deborah Ann (Simms) Thompson. James Alexander Thompson was born on September 17th 1827 in Long Island to John William Thompson and Deborah Sophia Thompson. John William Thompson's parents were Richard Thompson & Catherine Fernander who were married on February 23, 1795. (WikiTree, n.d.)

More extensive research will need to be conducted to determine whether Malvina was indeed a member of William Thompson's family.

4.3 Palm Villa

The plot of land known as Palm Villa, also known to some Long Island residents as "Palm Miller", is situated in the settlement of Gordons, and is about 2 acres long. None of the persons we interviewed was able to recall a time in living memory when the property was inhabited. Outside of the Watson family (see section 5.1 below), the existence of the gravestone and the ruins was news to most residents, even to those who have lived on the island for decades. (The limestone walls are a common feature of the Long Island landscape – everyone we spoke with who had ever been to the property was aware of them.)

Though it appears to be widely accepted by residents that the Palm Villa property was owned by the government, or "crown land" the Watson family, who is discussed at section 5.1 below, occupied the property and built homes there.

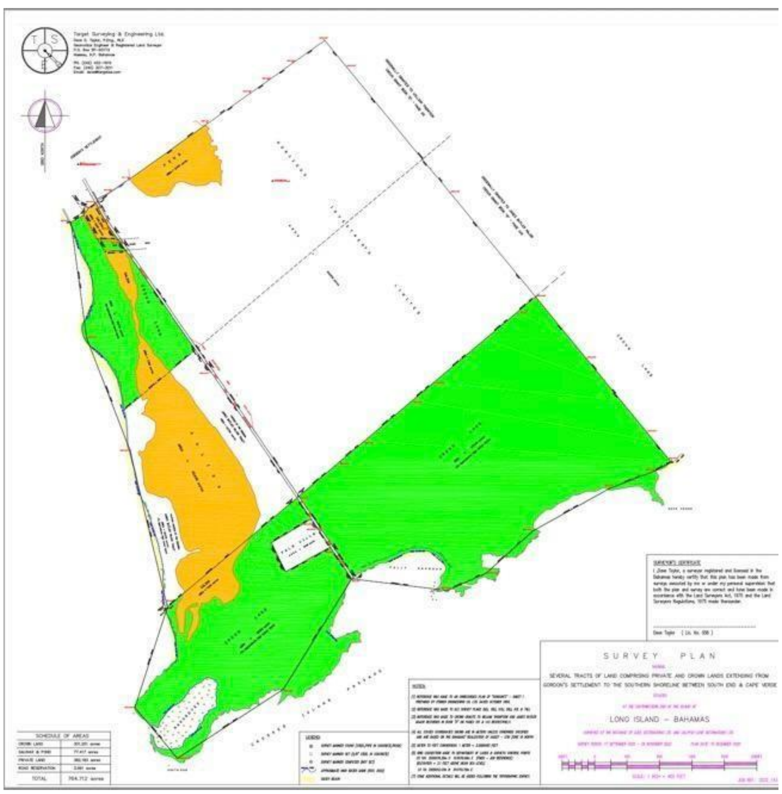


Figure:1 Map of Palm Villa

4.3.1 Agriculture

In days gone by, farming and fishing were the most common profession in Long Island, as well as many in other islands of The Bahamas. Even today, many of the remaining residents of the southern Long Island are engaged in these trades to some degree, though fishing and other maritime pursuits are more commonly practiced. Each person we interviewed told us that, dating from at least the late 19th century and continuing into the early 20th century, the Palm Villa property was primarily utilized by residents of neighbouring settlements as [arable] farm land. The property was thought to be at least partly owned by the government, or "crown land", and as such, was available to residents for their agricultural pursuits.

Residents would trek up to Palm Villa to their designated "fields", sometimes barefoot, and would weed, cut through the bush, and plant their crops, which largely consisted of staples like sweet potatoes, guinea corn, cassava, peas and beans, and sugar cane. Several of them also reared livestock on Palm Villa – sheep and goats – which were termed "creatures" by some respondents. One man interviewed, a 82 year-old resident of Mortimers, shared with us an interesting story from his early childhood of how his mother and other Palm Villa farmers would prepare food while on the property:

> You'd go walk up there, work, farm. When lunch time comes you'd catch a fire and roast sweet potatoes and corn. We'd go in the field, catch a fire and burn coal, then put the sweet potatoes and roast it. In those days, my mum and those would catch a fire, put a sea grape leaf over the coals, knead the bread, spread it out thin, rest that on the leaf and put another leaf on top of the bread and coal on top of the leaf. So the bread would bake just like that, and we'd eat it, when we'd go out in the field to farm at Palm Villa.

Residents would also go crabbing on the Palm Villa property during crab season – this practice is still carried out to this day. At night and especially in the summer months and after a heavy rain, when land crabs are plentiful and crawling, Long Islanders would make the trek to the property, usually on foot, to catch the crabs in sacks and either sell them or keep them for themselves, for use in native Bahamian delicacies. A 57-year-old male respondent from the nearby settlement of

Roses described the crabbing experience as being a lot of fun – “It used to be a crowd of us. We used to race to see who could catch the most. Big crabs. We’d wait on the rain and go [to Palm Villa] at night.”

4.3.2 Palm Villa Airstrip

We were informed by the same respondent from Roses that before he was born, an airstrip was built on the Palm Villa property. According to him, several decades ago, an airplane crash landed on the property and was later repaired. However, because the land was uncleared bush, the plane was not able to take off, so a makeshift airstrip was constructed to permit the airplane to leave the island. As his story goes, the airstrip was only used the one time, and afterward was reclaimed by the bush.

5. GENEALOGICAL RESEARCH

In order to fully understand the historical context of Palm Villa, and to answer the question of who was Louis P. Knowles Jr., we undertook a comprehensive genealogical exercise. Although the individual in question has the surname Knowles, we came to understand that this process required that we research the history of the Watson family, who is deeply rooted in Southern Long Island. Such research helps to shed light on the history of Palm Villa and on the identity of Louis P. Knowles Jr.

5.1 Watson Family

During our interviews with residents on their recollection of Palm Villa, we were told that much of the Gordons settlement was once owned by the Watson family. The Watson family tree can be traced back to 1780 with the birth of John Watson who later married Pricilla (Unknown) Watson. John and Pricillia had several children, one in particular was William Richard Watson who was born on September 7th, 1804.

William Richard Watson was married two times; his first wife was Catherine Jane (Major) Watson and his second wife was Louisa Maria Braddock Watson. He and Louis had several children, one in particular being Bruce Hayward Watson. Bruce was born in 1846 in Long Island and was married to Malvina Matilda Thompson, who was discussed in section 4.2 above. He is also the forebear of the prominent Watson family today. Bruce and Malvina's son William Wallace Winder Watson, is the grandfather of former Deputy Prime Minister of The Bahamas, Frank Watson.

William Wallace Winder Watson ("Watson") was born on November 1, 1885, in Long Island, Bahamas. He married Olita or Leitha Major, and together they had about 8 children. During the period relevant to this report, he was a prominent figure on the island, and was widely recognized as the patriarch of the Watson family. Like many men of his day, Watson was engaged in the noble professions of fishing and farming. He also operated a mailboat that would sail between Nassau and Long Island, transporting goods and people.

We spoke with one of Watson's grandnephews, who shared the following with us about him:

> He would've been like all them, a farmer, a fisher. He might have been a little more entrepreneurial than the average in them days. He might have been a big shot. He had a sailboat, and he probably had a couple more goats and stuff [than the average person]. He might have had a horse. He probably had a bit more of a business head. He used to sail from Nassau. It used to take 2 weeks [to make the journey from Nassau to Long Island on the sailboat] back in them days.

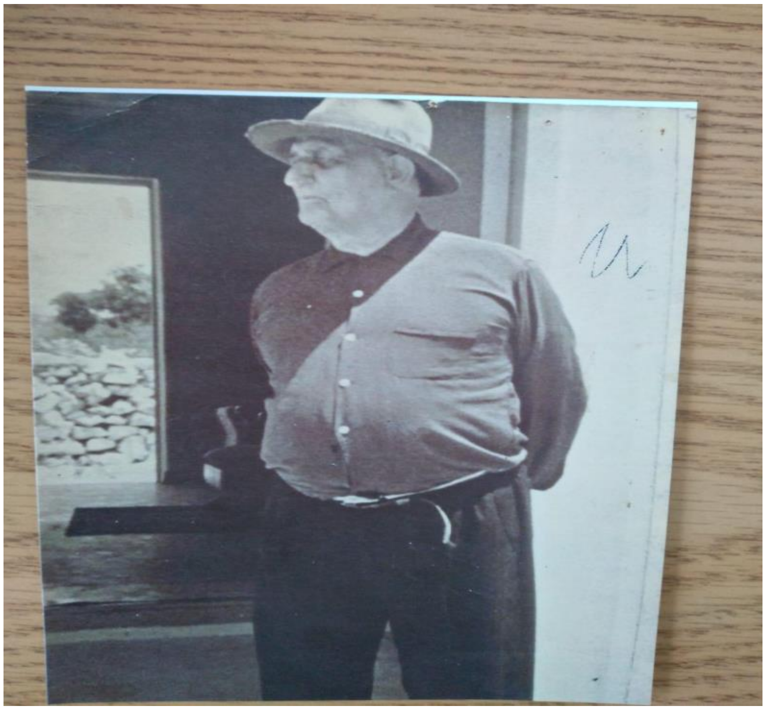


Figure 2: Photo of William Wallace Winder Watson in Palm Villa

Several persons with whom we spoke told us that Watson would employ persons from the neighbouring settlements of Gordons and Mortimers as tenant farmers on property in Palm Villa. The 82-year-old interviewee from Mortimers said the following of him:

"William Watson used to have people work for him, make farm. Sometimes he had a little shop. When the people would work and ain't get no money, they'd work and they get something, some groceries [in exchange] for farming. They'd work all day and he'd give them food. That's their pay. Ine know nothing much about Watson. When I born I met him here. I know he used to do farming. Raise hog and goat and sheep and things."

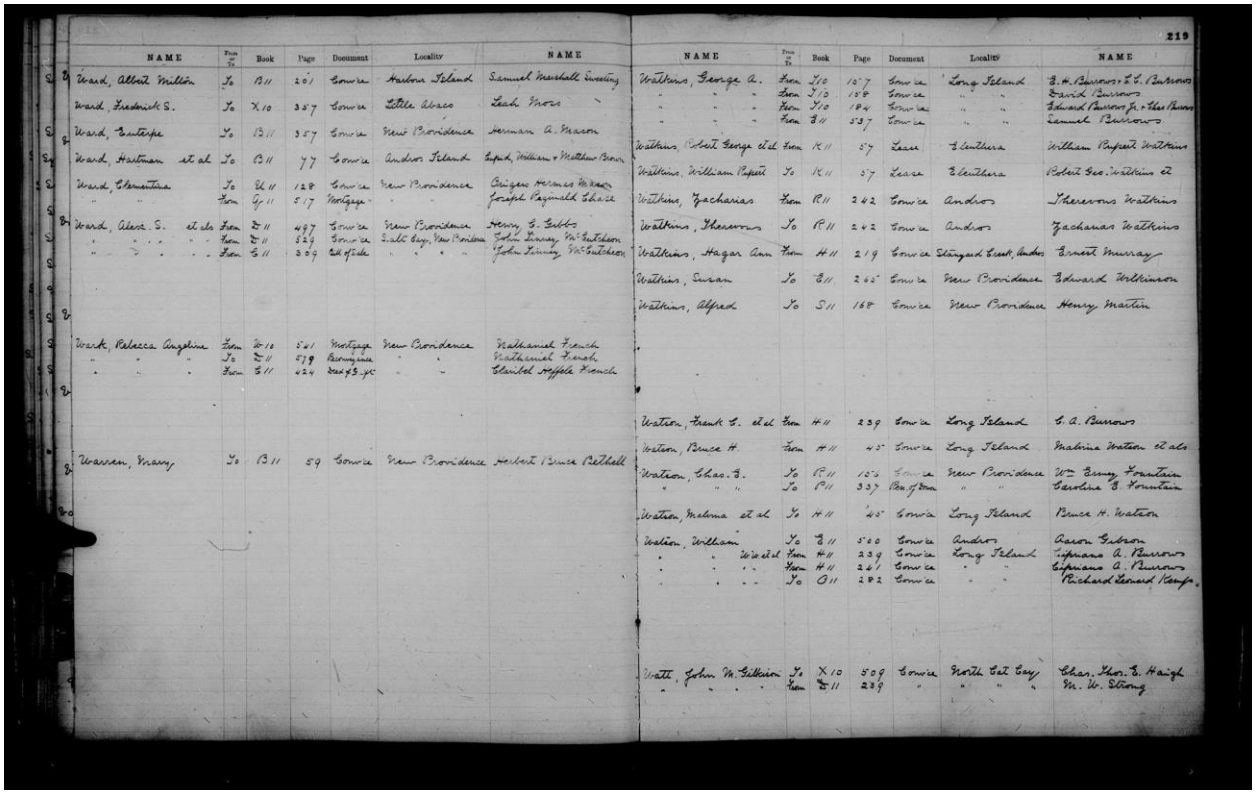
From this interviewee's description, it is possible that Watson engaged in "sharecropping" and/or the "credit and truck" system, two related labour systems that were prevalent in the period following emancipation from slavery. Sharecropping was often seen as a way for landowners to maintain control over labor and for tenant farmers to have access to land and resources that they otherwise couldn't afford. The credit and truck system was a wage and credit mechanism that permitted purchase of store goods by employees, against future payment in kind - in lieu of wages. In this "typical share-system arrangement, widely adopted in the early years after emancipation, the tenant gave the landlord either one third or one half of the crop in return for the privilege of cultivating the land." (Johnson, 1986, 7290-753)

Both of these systems are largely regarded as highly exploitative, and often trapped tenant farmers in a cycle of debt and poverty. However, aside from the anecdote by the Mortimers resident, we have no other evidence to bolster any claim that Watson was engaged in such practices.

We spoke with one of Watson's granddaughters, who told us that it was common knowledge during this period that title to virtually the entire Gordons community was held by the Watson family, but that over time the requisite title deeds were misplaced, and so for many years the family has been on the quest to locate legal paperwork to answer the land ownership questions. Like many communities in The Bahamas, the current system of land ownership and registration has been a major concern for many families.

Another Watson family member mentioned that the Palm Villa property "was owned by Thompson. Thompson did own the land, and that's who Calypso bought it from. Thompson land start from our property. I remember Thompson bought it from Lester Brown (a prominent Bahamian realtor in the 1960s and 1970s). I am still young so I wouldn't know much about it.The property does not have significance to the community."

We were able to locate copies of official records that show that land on Long Island was transferred between Bruce Hayward Watson and his wife Malvina Matilda Thompson Watson, but the records do not identify the property. We are advised that a property search to ascertain where the said property is located is likely to be long and protracted, not to mention expensive, given the age of the records.



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NAME	From or To	Book	Page	Document	Locality	NAME
Ward, Albert Millton	To	B11	201	Conv'ce	Harbour Island	Samuel Marshall Sweeting
Ward, Frederick S.	To	X10	357	Conv'ce	Little Abaco	Leah Moss
Ward, Euterpe	To	B11	357	Conv'ce	New Providence	Herman A. Mason
Ward, Hartman et al	To	B11	77	Conv'ce	Andros Island	Cupid, William + Matthew Brown
Ward, Clementina	To	U11	128	Conv'ce	New Providence	Origen Hermes Mason
" "	From	G11	517	Mortgage	"	Joseph Reginald Chase
Ward, Alex. S. et als	From	D11	497	Conv'ce	New Providence	Henry C. Gibbs
" "	From	D11	529	Conv'ce	Salt Cay, New Providence	John Linney McCutcheon
" "	From	C11	309	Bill of Sale	"	John Linney McCutcheon
Wark, Rebecca Angeline	From	W10	541	Mortgage	New Providence	Nathaniel French
" "	To	D11	579	Reconveyance	"	Nathaniel French
" "	From	C11	424	Deed of G. gt.	"	Claribel Heffele French
Warren, Mary	To	B11	59	Conv'ce	New Providence	Herbert Bruce Bethell

NAME	From or To	Book	Page	Document	Locality	NAME
Watkins, George A.	From	T10	157	Conv'ce	Long Island	E. H. Burrows + L. C. Burrows
" "	From	T10	158	Conv'ce	"	David Burrows
" "	From	T10	184	Conv'ce	"	Edward Burrows Jr. + Chas Burrows
" "	From	E11	537	Conv'ce	"	Samuel Burrows
Watkins, Robert George et al	From	K11	57	Lease	Eleuthera	William Rupert Watkins
Watkins, William Rupert	To	K11	57	Lease	Eleuthera	Robert Geo. Watkins et
Watkins, Zacharias	From	R11	242	Conv'ce	Andros	Therevons Watkins
Watkins, Therevons	To	R11	242	Conv'ce	Andros	Zacharias Watkins
Watkins, Hagar Ann	From	H11	219	Conv'ce	Stanyard Creek, Andros	Ernest Murray
Watkins, Susan	To	E11	265	Conv'ce	New Providence	Edward Wilkinson
Watkins, Alfred	To	S11	168	Conv'ce	New Providence	Henry Martin
Watson, Frank C. et al	From	H11	239	Conv'ce	Long Island	C. A. Burrows
Watson, Bruce H.	From	H11	45	Conv'ce	Long Island	Malvina Watson et als
Watson, Chas. E.	To	R11	156	Conv'ce	New Providence	Wm Emery Fountain
" "	To	P11	337	Ren. of Dow.	"	Caroline E. Fountain
Watson, Malvina et al	To	H11	45	Conv'ce	Long Island	Bruce H. Watson
Watson, William	To	E11	500	Conv'ce	Andros	Aaron Gibson
" " W.W. et al	From	H11	239	Conv'ce	Long Island	Cipriano A. Burrows
" "	From	H11	241	Conv'ce	"	Cipriano A. Burrows
" "	To	O11	282	Conv'ce	"	Richard Leonard Kemp
Watt, John McGilkin	To	X10	509	Conv'ce	North Cat Cay	Chas. Thos. E. Haigh
" "	From	D11	239	"	"	M. W. Strong

Figure 3 : Land records between Bruce Hayward Watson and Wife Malvina Matilda (Thompson) Watson

5.2 Who was Louis P. Knowles Jr.?

After the discovery of the Gravestone on the Palm Villa property, we were asked to provide information on the identity of Louis P. Knowles Jr, the person whose name is inscribed on said stone. We uncovered the following information:

Louis Philip Knowles Jr. (“Louis Junior”) was born on March 16, 1868, in St. Matthews Parish, New Providence. He was one of 10 children born to Louis Philip Knowles Sr. (“Louis Senior”) (d.o.b. May 7, 1837 in Rock Sound Eleuthera) and Mary Priscilla Sawyer (d.o.b. February 4, 1845 in Harbour Island, Eleuthera). Louis Senior’s grandson told us that he grew up in Rock Sound, but it seems as though he moved to Nassau in his adulthood. He and Mary were married in New Providence in 1863, though their first child was born in Rock Sound, Eleuthera; their other children were born in New Providence.

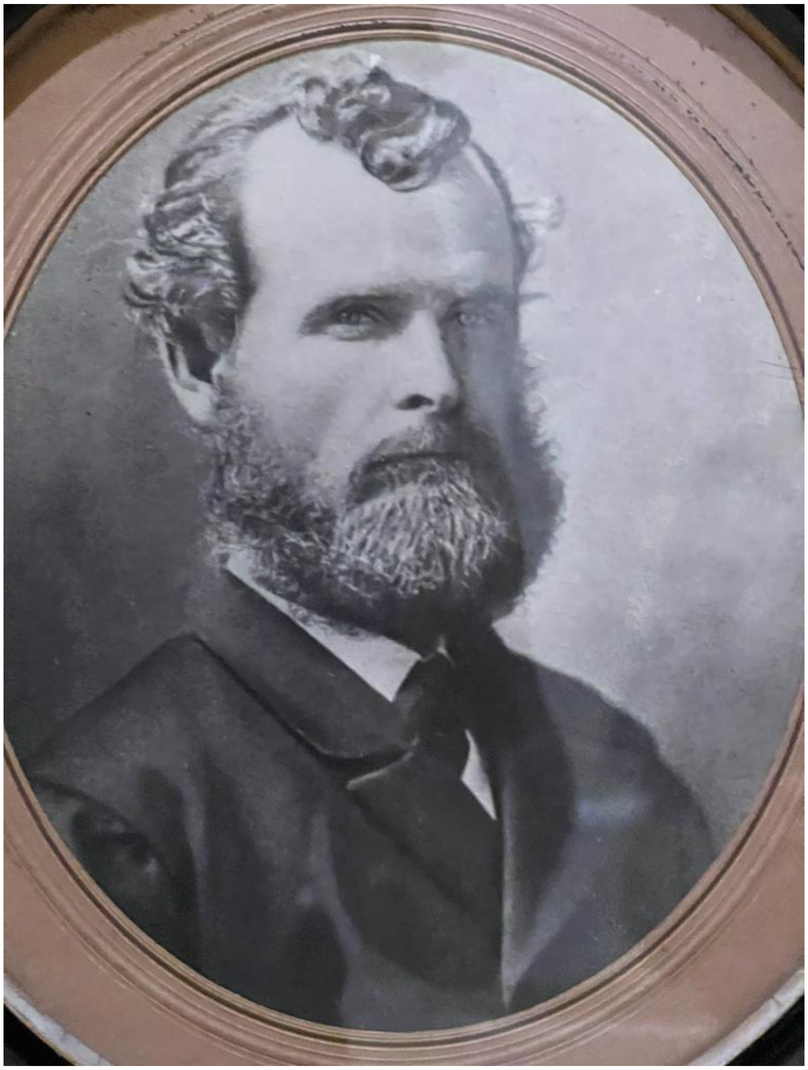


Figure 4: Portrait of Louis Philip Knowles Sr.

Louis Senior was a farmer and fisher - according to his grandson, “he did the kind of work that every man did to support his family. He had his field, he had his little goats and sheep”. However, on Louis Junior’s birth record, he was listed as a shopkeeper. He lived with his family in Nassau until Mary’s death on September 6, 1895, when she was 50. One year later, at the age of 59, he was married again, this time to Constance Frances Hulda/Hilda Watson.

Figure 7 : A younger Constance Frances Huldah Knowles and unknown child
Second Photo - An older Constance Frances Huldah Knowles and descendants

Constance, who was 18 years old[1] at the time of her marriage to Louis Senior, was the daughter of Bruce and Matilda (Thompson) Watson. She was born on 5 June, 1875 in Long Island. A year after their marriage, they started their family in Nassau, and together they reared 8 children before Louis Senior's death on December 1, 1914, at the age of 77. His cause of death is listed as "natural decay" on his death records; his grandson told us that he died from gangrene that developed from a cut on his leg.

Senior's grandson told us that his grandmother Constance lived and raised her family in Nassau until her death on August 15, 1960. He described her as a housewife, who took care of the children and the house. He said of her, "She was old time people, very nice. She'd say 'yes darling', everything was nice, it was never no fussing, no rowing, no carrying on. She played with us all the time. Big old arm around us, big old hand around us. She'd do that all day."

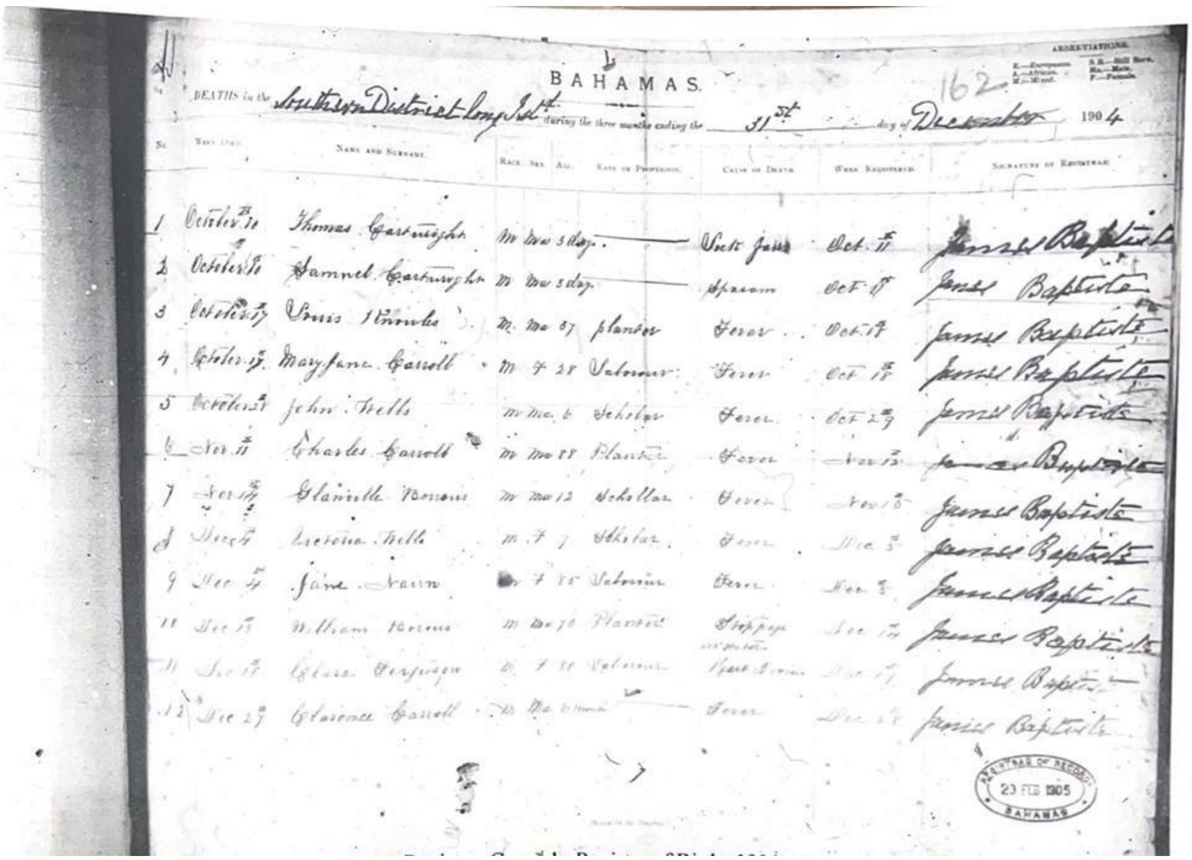
[1] Louis Senior and Constance's marriage certificate states that she was 21 at the date of the marriage; however, she was born in 1875 - https://www.familysearch.org/ark:/61903/1:1:QJDZ-7D13

2 years before his mother's death, and 3 years before his father's remarriage, Louis Junior got married at the age of 25, to Teresita Arteaga, of Nassau. We believe that Teresita was of Cuban heritage. (Interestingly, her sister, Mary Elizabeth Arteaga, married Junior's brother, Granville Knowles.) It appears that Junior and Teresita began their lives in Nassau. They began having children the year after they were married, and had 7 children all together.

Figure 5: Teresita Caroline Artega Knowles with her daughter Terry

An assessment of available records provides that Louis Junior engaged in a number of professions - he was listed as a butcher on several of his children's birth records, and as a clerk on another. On his death record he was listed as a planter (another word for farmer).

Louis Junior died in Long Island on October 18, 1904 at the age of 37, of a fever. It is not clear to us why he was in Long Island at the time of his death. It appears that he had very little connection to the island - he was born and raised in Nassau and spent his young adulthood there, then started a family there. His father, Louis Senior, also lived in Nassau during his marriage to Constance.



BAHAMAS.

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ABBREVIATIONS. E.—European. A.—African. M.—Mixed. S.B.—Still Born. Ma.—Male. F.—Female.

DEATHS in the Southern District Long Isl^{d} during the three months ending the 31st day of December 1904

No.	When Died	Name and Surname	Race	Sex	Age	Rank or Profession	Cause of Death	When Registered	Signature of Registrar
1	October 10	Thomas Cartwright	M	Ma	3 day	—	[illegible]	Oct. 11	James Baptiste
2	October 10	Samuel Cartwright	M	Ma	3 day	—	Spasm	Oct 15	James Baptiste
3	October 17	Louis Knowles	M.	Ma	67	planter	Fever	Oct. 17	James Baptiste
4	October 17	Mary Jane Carroll	M	F	28	Labourer	Fever	Oct 18	James Baptiste
5	October 21	John Wells	M	Ma.	6	Scholar	Fever	Oct 29	James Baptiste
6	Nov 11	Charles Carroll	M	Ma	88	Planter	Fever	Nov 13	James Baptiste
7	Nov 14	Glanville [illegible]	M	Ma	12	Schollar	Fever	Nov 15	James Baptiste
8	Dec 2	Victoria Wells	M	F	7	Scholar	Fever	Dec 3	James Baptiste
9	Dec 4	Jane Nairn	[illegible]	F	85	Labourer	Fever	Dec 5	James Baptiste
10	Dec 13	William [illegible]	M	Ma	70	Planter	Stoppage of water	Dec 14	James Baptiste
11	Dec 17	Clara Ferguson	M	F	38	Labourer	Heart Disease	Dec 17	James Baptiste
12	Dec 27	Clarence Carroll	M	Ma	[illegible]	—	Fever	Dec 28	James Baptiste

REGISTRAR OF RECORDS 23 FEB 1905 BAHAMAS

Figure 6: Death record of Louis Philip Knowles Jr.

After Louis Junior's death, his wife Teresita moved to the United States (Florida and then New York, and then back to Florida) and remarried, at least once and perhaps twice. She died in Miami Dade, Florida on November 18, 1965 at the age of 84.

We attempted to contact the progeny of Junior and Teresita to see if we could find any information on Louis. Most of their direct descendants are living in the United States. Their last remaining child died on March 19th, 1992, and one of their last grandchildren (Teresita Adeline Copenhaver, the third person named Teresita in their lineage) died in 2022.

Through extensive Internet data searches, we were able to locate and contact one of their family members living in the United States (the niece by marriage of Louis Agramonte Knowles, one of Louis Junior and Teresita's children). She told us that her uncle Louis Agramonte did share family stories with her, but she was unable to remember if any of them concerned Junior. She promised to reach out to other family members who may have had more information, but we have not heard from her since.

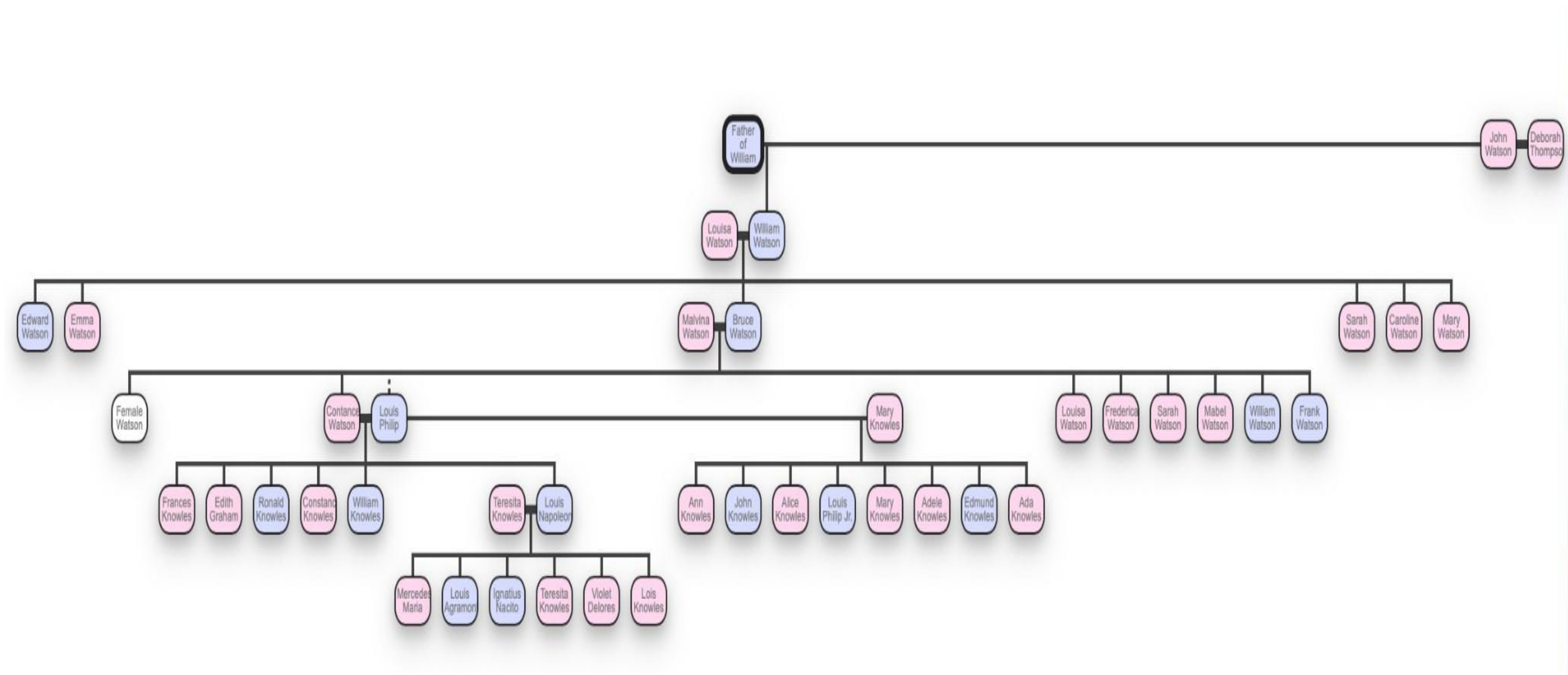

Figure 7: Family Tree

6 HERITAGE ASSETS

With reference to the Heritage Assets, we will assess the possible value of each of these, the particular historical placement, and whether they are eligible for protection under Bahamian law/merit protection.

6.1 What a heritage asset is

In every community in The Bahamas there exists evidence of the past - the way that communities were structured and how individuals once lived. This evidence is known as the "historic environment", and continues to shape our societies today. The historic environment of The Bahamas comprises "heritage assets", a term which describes a range of geographical components of the historic environment which have been positively identified as having a degree of significance meriting consideration in planning decisions.

The definition employed by the National Planning Policy Framework of the United Kingdom states that:

> "Heritage assets range from sites and buildings of local historic value to those of the highest significance, such as World Heritage Sites which are internationally recognised to be of Outstanding Universal Value. These assets are an irreplaceable resource, and should be conserved in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of existing and future generations".

Heritage assets can fall into a number of groups which are relevant to this report; these include buildings, structures, and sites/places. We will consider the definition of each heritage asset, the asset in its particular historical context, and the degree of protection that the asset may merit.

6.2 Buildings

The Buildings comprise the remains of two dilapidated buildings. The first is at least four times as large as the second, and they both are missing their roofs and most of their walls. We are informed by members of the Watson family that the larger structure was inhabited by Constance Watson and her husband, Louis P. Knowles Sr. after their marriage, and that the smaller structure was possibly an outdoor kitchen. Another member of the Watson family told us that the larger structure, or possibly another structure that has not yet been located, was once used as a church. No other person interviewed has shared a similar narrative.

Figure 8: Building Structure in Palm Villa

Figure 9: Building Structure in Palm Villa

The Buildings fall under the heritage asset category of "sites and places". Sites and places are areas that have connections to a specific person, activity or event, or that incorporate multiple elements that collectively tell a particular story or illustrate the passage of time. This can include archaeological assets that incorporate the remains of previous human interventions into the landscape. These assets will often be incomplete, but were once permanent structures, as is the case with the Buildings.

The principal heritage values of sites and places like the Buildings could be communal (the importance of a place, site or asset to people's collective identity), archaeological (the potential for a site or monument to reveal information about a place, type of asset, community, or past human activity), historical illustrative (the ability of an asset to illustrate its original purpose and the activities it supported), or historic associative (the connections the asset has to important events or people - perhaps the Watson family could be considered "important" to the history of South Long Island for these purposes).

Because the Buildings are incomplete, they do not fall within the heritage asset category of "buildings", which are defined as man-made constructions that are designed to be inhabited. In order to be treated as a heritage asset, the building in question must still be in use for the purpose of inhabitation, or capable of being brought back into use, and as such, they must have walls and a roof. The Buildings that are the subject of this Profile do not fit these criteria.

Based on the present appearance of the Buildings, we believe that they were built in the traditional English architectural style of limestone cottages, which was brought to The Bahamas by the British, and adapted for the weather of The Bahamas. Houses were often angled to receive winds for ventilation and cooling with large windows and high ceilings, and the outside of the buildings would be painted in light colours to reflect the sun, and would often feature more windows than their British counterparts.

The Buildings were constructed at least partly out of lime. In the 1800s, the material for many Bahamian homes was produced using a method known as lime slaking or lime burning, which was a technology first introduced to the British by the Romans, and later brought to The Bahamas by the British subjects who resided here. Lime burning was facilitated by the use of lime kilns, which are structures used to manufacture lime (calcium oxide) by burning calcium carbonate at temperatures above 900°C. The calcium carbonate burned was commonly limestone (as the islands of The Bahamas are largely built of limestone in one form or another, this was easily obtainable), but other materials such as oyster, egg shells - or in The Bahamas, conch shells - were used. The lime that was produced formed the basis of plasters, mortar, and concrete.

Because there is no roof attached to either of the Buildings, we can only speculate as to what kind of roofing was used. Some homes, especially those belonging to less affluent Bahamians, used thatch roofs; these roofs would be fashioned out of Palmetto fronds and sometimes "trash", which was the leftovers from the sugar cane harvest, as well as mortar, which would commonly be a mixture of lime and sand. The tradition of thatching roofs was employed both in England and in West Africa and is said to have been imported to The Bahamas from these places (roofs in England were often thatched from wheat or straw, while roofs in West Africa would be thatched from grass and reeds) and modified to suit this particular environment.

In the 1800s and before, roofs in The Bahamas were also frequently constructed out of wood shakes, or wood shingles. Wooden shingle roofs were prevalent during that period in the North American colonies, as wood was plentiful there as compared to England, where timber was a scarcer resource. (Cement tiles became the most frequently used roofing material in England at the turn of the 19th and 20th centuries, when their production was automated.) Wood shakes were often imported into The Bahamas from North America. It is likely that, given the social prominence of the Watson family in Long Island, the roofs of the Buildings were fashioned from wood shakes rather than thatch.

We have not been able to locate any images of the Buildings while they were still standing. We did receive a photograph from a member of the Watson family, of houses in the Gordons settlement that are said to have been built around the same time and to share a similar construction to that of the larger of the Buildings. They have, of course, undergone renovations over the years. We have included this photograph for illustrative purposes:

Figure 10: Similar buildings in Long Island

6.3 Gravestone

The Gravestone is a reasonably large, weathered concrete structure that is well-preserved and in relatively good condition. It is engraved with standardized lettering that is still legible, and is located a few metres away from the Buildings. A Watson family member informed us that there is a second gravestone on the property, but we have not had sight of the same.

Figure 11: Gravestone with inscription

The Gravestone falls under the heritage asset category of “Structures”. Structures are man-made constructions other than buildings that are not usually used for habitation. They may be practical in form and function, solely decorative, or a combination of both. Structures include headstones and gravestones, as well as other constructions like bridges and piers and boundary walls (to be considered below). They typically have architectural and historical illustrative value, as well as aesthetic/artistic value (the visual and experiential qualities of a site or structure).

It is not of great import that the Gravestone was located on the Watson property rather than in a nearby churchyard or cemetery. The practice of marking graves near homes dates back millennia; while burials at places of worship dates back in Europe to the 6th to 14th centuries, it wasn’t until the mid-1600s that burials in cemeteries became common.

The Gravestone is made from what appears to be concrete, which is the most common alternative to the now typical carved stone materials, and is commonly found in cemeteries in The Bahamas, especially those in the Family Islands. Once stigmatized in comparison to materials like granite and marble, as concrete gained respectability as a building material in the late nineteenth and early twentieth centuries, the stigma attached to concrete grave markers diminished. Historically, the use of concrete grave markers was an indication of economic humility. Notwithstanding the degree of relative affluence enjoyed by families like the Watsons, life in The Bahamas, and in the Family Islands in particular, was hard, and importing grave markers made of “prestige” materials like granite and marble was most likely not an option for them.

While in Long Island, we visited a number of burial grounds in South Long Island to compare gravestone construction there to our Gravestone:

- Dunmore Public Cemetery
- Holy Trinity Catholic Church (Taits Settlement)
- Our Lady of Mt. Carmel Catholic Church (Hamiltons Settlement)
- Cartwrights Gospel Chapel (Cartwrights Settlement)

We were not able to locate gravestones in Southern Long Island that dated as far back as the Gravestone in question. Many appeared to be made out of concrete, and only a handful were as sturdy and impressive as our Gravestone, and these tended to be more modern.

There is no indication as to when exactly the Gravestone was placed on the property, though we can safely assert that it was after 1904. We note that the date of death on the Gravestone is 27 November, 1904, but in the death record it is listed as 18 October, 1904. Louis P. Knowles Jr’s age is also given as 34 years on the gravestone; however, available records show that he was 37 years old at his death. We have posited that the existing public records are “more correct” than the information on the Gravestone, and have thus inferred that the tombstone was placed on the property long enough after Mr. Knowles’ death that the details had faded a bit in memory.

Monument lettering also offers up clues as to when the Gravestone may have been placed. Prior to the 1850s, monuments were still largely created by hand, and highly specialized letter carvers were employed to engrave inscriptions (or, as we saw in a few of the more humble Long Island graveyards, the deceased's name and death date would be carved into the cement gravestone with a stick or possibly someone's finger). The sandblasting process for letter engraving came into being in the 1870s, but was not fully adopted by the monument industry for some 50 years.

The early 1900s saw the increased standardization of monument lettering styles, and these styles began to be more thoroughly documented and distributed through articles in trade publications, the creation of lettering plates, and the printing of lettering books. One of these standardized styles was created by F. A. Church, who began his Practical Lettering for Memorials column in the American Stone Trade magazine between 1912 and 1915, with the intent of educating the industry on a mechanical process to allow less skilled draftsmen to lay out lettering without freehand drawing.

Figure 12: Photo of FA Church’s lettering style

We note that F. A. Church’s lettering style is remarkably similar to that of the Gravestone and it is possible that Church’s lettering plates were used to engrave the Gravestone.

Figure 13: Comparison between F.A Church's Lettering style to what in on the Gravestone

We therefore cautiously assert that if this is the case, the Gravestone was likely placed some time after 1912-1915, which was when the lettering plates were distributed. How soon after that, we are unable to say.

We did attempt to find out whether a Bahamian company may have provided the Gravestone but unfortunately we met a dead end. As the Gravestone is on private property and not in an established burial ground we could not contact any of the cemetery or church administration for information. We reached out to a number of funeral homes and headstone providers and engravers but they were unable to assist, as they each were established well after Junior's death and had maintained no records that could aid us in answering this question. It is possible that the tombstone was shipped to Long Island from New Providence, or from outside the country. Less likely is that the tombstone was constructed in Long Island.

6.4 Wall

Running the length of the property and beyond is a low wall, about 3-4 feet high, made of stacked stones, and crumbling in sections. Walls like it are ubiquitous in the island and form part of the natural landscape. Globally they are referred to as dry stone walls, and are known locally as "lime walls", or "slave walls". These walls are not unique to Long Island, but are found on a number of Family Islands.

Figure 14: Boundary Wall in Palm Villa

Figure 15 :: Boundary Wall in Palm Villa

Like the Gravestone, the Wall falls under the heritage asset category of “Structures”. They are practical in form and function, and like other such structures, have architectural, historical illustrative, and aesthetic/artistic values.

These walls are said to date to the Loyalist era, when they were constructed to mark the boundaries of fields, pastures, and quarters. There is a widely-held belief that they were built by enslaved Africans in Long Island at the behest of plantation owners. One of our interviewees told us the following about them:

> These walls, I guess the slaves built them back in the day. They're all over the island. The walls are for saying, I own this side, you own that side. That's how you can know my property from your property. They were for pastures, for animals. Just like how [today] you could wire in a place to keep the animals, they used to build walls back in the day. Them old people musse coulda work, ey? I mean, to tote rock, and build walls 6 feet high, and no cement!

Dry stone, sometimes called drystack, is a building method by which structures are constructed from stones that fit together firmly, without any mortar to bind them together. The construction method used to ensure stability and longevity is to create a load-bearing facade of carefully selected interlocking stones, and to ensure that the base is wider than the top. When properly done, it can last for thousands of years.

Dry stone is a traditional craft that dates back to time immemorial. It is best known in the context of stone walls, traditionally used for the boundaries of fields and churches, but dry stone sculptures, buildings, bridges, and other structures also exist. Evidence of the technique can be found across ancient civilizations back to the Bronze and Neolithic ages - structures were erected in Northwestern and Central and Southeast Europe, Africa and (depending on your definition of what constitutes dry wall[2]) the ancient civilizations of Maya and Inca.

The building pattern of the walls are said to reflect contemporary systems of agriculture. Medieval walls show the open field methods practiced at the time, while the later enclosure of common land into private holdings tended to create a patchwork of small irregular shaped fields. This latter

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[2] Maya and Inca cultures used precisely-shaped stone in the constructions of their places of worship, but did not use mortar. In most other societies that used dry stone technique, the stones were not precisely shaped, but were selected from what was readily available to them.

building pattern coincides with what is evidenced in Long Island, where the walls are used as boundaries for private property and tend to enclose fields.

The art of dry stone walling was inscribed in 2018 on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity, for dry stone walls in countries such as Croatia, Cyprus, France, Greece, Italy, Slovenia, Spain and Switzerland. The inscription provides the following:

> Such structures testify to the methods and practices used by people from prehistory to today to organize their living and working space by optimizing local natural and human resources. They play a vital role in preventing landslides, floods and avalanches, and in combating erosion and desertification of the land, enhancing biodiversity and creating adequate microclimatic conditions for agriculture. The bearers and practitioners include the rural communities where the element is deeply rooted, as well as professionals in the construction business. Dry stone structures are always made in perfect harmony with the environment and the technique exemplifies a harmonious relationship between human beings and nature. The practice is passed down primarily through practical application adapted to the particular conditions of each place.

The walls throughout Long Island are generally in a state of disrepair, and it does not seem that any renovations to the walls have occurred for a great number of years. We have not been able to locate any dry stone practitioners on the island or in The Bahamas in general.

7. BAHAMIAN LEGAL CONTEXT

Under Bahamian law, matters related to heritage and history are generally governed under the Antiquities Monuments and Museums Act, 1998 (the “Act”). The Act provides for the preservation, conservation, restoration, documentation, study and presentation of sites and objects of historical, anthropological, archaeological and paleontological interest. Such work is conducted by the Antiquities Monuments and Museums Corporation (“AMMC”).

We have considered what we deem to be the relevant sections of the Act, which may impact the treatment of the heritage assets.

7.1 Antiquity

Section 2 of the Act defines an "antiquity" as:

(a) an artifact [defined as a movable object, fossils or remains]; or

(b) a place, building, site or structure erected, formed or built by human agency which is at least fifty years old and the ruins or remains of any such place, building, site, or structure, whether or not the same has been modified, added to or restored at any time.

A "discovery", pursuant to section 2 of the Act, includes the finding of any antiquity or supposed antiquity on land, or that is attached to or within the fabric or foundations of a structure in or on land, the presence of which was previously unknown to the owner of such land or structure.

7.2 Declaration of a Monument

Once an antiquity has been discovered, section 3 of the Act provides that if the Minister responsible for AMMC[3] considers that it is of public interest by reason of its historical, anthropological, archaeological or palaeontological significance, he or she may, after consulting with the Board of AMMC, declare that antiquity a "monument". Any land adjoining the monument may also be included as part of the monument, if it is required for fencing, covering, or protecting the monument, or for providing or facilitating access to the monument.

Before making a declaration, the Minister must sign a plan clearly showing the location of the proposed monument (a "Plan"), and deposit said Plan in the Registrar General's Department. If

[3] As of the date of this report, the Minister responsible for AMMC is The Right Honourable Philip Davis, Prime Minister of the Commonwealth of The Bahamas.

the monument is on private land, the declaration must also be registered in the Registrar General's Department. Notice of the declaration must be gazetted, or published in local newspapers.

The Plan must be delivered to the owner or lawful occupier of a monument, free of charge.

Section 4 of the Act provides that where the monument is within private land, the owner and/or lawful occupier of the land must be served notice in writing of the intention to declare a monument, along with a Plan. The owner/lawful occupier may then object to the proposed monument by applying to the Supreme Court, within one month (or a longer period, if the Supreme Court allows). The Supreme Court must then consider the application, and may decide on whether or not the proposed declaration should be made. If the Court decides that it should be made, it may subject the declaration to the variations or conditions that it thinks fit.

7.3 Right to Enter/Preserve/Restore etc. Monument

Under Section 5 of the Act, the Minister, or an authorized person, may, at all reasonable times –

(a) Enter and inspect any monument;

(b) Fence, repair, maintain, preserve or restore any monument; or

(c) Excavate or search for artifacts in any monument and remove any artifacts hitherto undiscovered.

The Minister or the person he or she designates must notify the owner/lawful occupier before entering the premises, but such notification can be dispensed with if the Minister considers it necessary to do so. However, this right to enter and inspect does not authorize the owner/lawful occupier of the monument, a person beneficially interested in the monument, or a person authorized by either of these, to be excluded from any part of the monument.

7.4 Doing Work On Monument

Section 6 of the Act provides that once an antiquity is declared to be a monument, no person shall, except in accordance with a permit granted by the Minister –

(a) excavate, carry on building or other work, plant or fell trees or deposit earth or refuse on, in or near a monument; or

(b) demolish, remove, obstruct, deface or interfere with a monument.

Section 7 of the Act provides that the Minister may grant a sum of money to assist a person proposing to carry out work for the maintenance, preservation, restoration, documentation, study, or presentation of a monument.

7.5 Compensation to Owner/Lawful Occupier

If the owner/lawful occupier of a monument suffers financial loss, or is likely to suffer financial loss, as a result of the exercise of the Minister's powers under section 5(1) of the Act (right to enter/inspect/repair/maintain/restore etc the monument), or as a result of a refusal to grant a permit or any conditions imposed in a permit, the Minister must pay compensation to that person, pursuant to section 8 of the Act. The compensation must either be an amount agreed between the Minister and the owner/lawful occupier of the monument, or an amount assessed by the Supreme Court. However, no compensation will be awarded for financial loss occurring as a result of anything done after the owner/lawful occupier was served notice of the declaration.

7.6 Discovery and Excavation of Antiquities

Section 11 of the Act provides that any person who discovers, or knows of the discovery of an antiquity or supposed antiquity, must report the discovery to the Minister or to a designated person, and must take all reasonable measures to protect the antiquity. Once such a report is made, the Minister or designated person can enter the property to inspect the antiquity.

8. APPLICATION OF THE ACT

Each of the heritage assets, being more than fifty years old, meets the criteria for an “antiquity” under the Act.

In order to be declared a monument, each of the heritage assets must be considered to be of public interest by reason of its historical, anthropological, archaeological or palaeontological significance. There is no publicly available information as to what meets this particular standard. Given the information detailed in this report, it is possible that the assets may satisfy whatever standard exists.

In other jurisdictions, nominated heritage assets must first be assessed against a number of criteria that help to highlight qualities that make the asset special and set out its contribution to the historic character of the area. For example, Historic England’s advice note on Local Heritage Listing sets out several criteria for assets, which include the asset’s age, rarity, architectural and artistic interest, group value, archaeological interest, historic interest, and landmark status *(Local Heritage Listing*, Historic England Advice Note 7 (2016).

If similar criteria for declaring monuments are applied in The Bahamas, perhaps the Gravestone would be the most likely of the 3 heritage assets to be considered to be of public interest.

With respect to the Buildings and the Wall, the criterion of rarity may be of note. A Local Heritage List for South Yorkshire, England, provides that rarity should be judged against local characteristics and themes. “What may be rare in one part of the country may be widespread in another, so the rarity of an asset has to be considered in relation to individual circumstances in any local area”. For Buildings/Structures, the rarity criteria is as follows: Is the asset rare for the local area, or rare in the sense that it is a good surviving example of a particular type of structure?

As dry stone walls can be found all over Long Island, and as the Wall is not in particularly good quality especially compared to others, and is not in active use as a boundary wall like other walls on the island, it may not meet this or other asset criteria. However, in other jurisdictions, the destruction of any dry stone walls is bemoaned, and the fact that the dry stone walling technique is inscribed on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity, may impact whether our Wall meets the Bahamian standard of being of public interest, under the Act.

There are also a number of abandoned buildings and building ruins in Long Island that may be of similar construction and age as the Buildings, so again, rarity must be considered (but perhaps, the family history of the Watsons and Knowles will be sufficient to generate historic interest in the Buildings).

Once the owner of the property on which the heritage assets are located suspect that they may be antiquities, he/she has a duty under the Act to report this suspicion to the Minister. In practice, such a report will be made to AMMC. We are advised that AMMC will then be tasked with conducting an archaeological and/or other assessment of the proposed antiquities to determine whether they meet the criteria of being declared monuments. If they are, notice will have to be duly given to the owner/occupier.

If either or all of the heritage assets are declared monuments under the Act, no work should be carried out on or near them, except with permission granted by the Minister. However, if any financial loss is suffered due to this, it may be possible to receive compensation from the government.

Further, if there is an interest in preserving or repairing the heritage assets, and a proposal is put forth to the government, the Act provides that a sum of money may be granted in respect thereof. We are not able to provide information as to how this process will work in practice, or whether it is likely or common for such compensation to be paid.

9. CONCLUSION

The historical heritage research conducted herein has shed light on the history of the Palm Villa community in Long Island Bahamas. Through meticulous research, examination, and interpretation, we have uncovered the rich tapestry of stories, events, and people associated with this community. We have attempted to ensure that this endeavour has aided in unraveling the intricate connections between the site and the broader historical narrative, allowing us to appreciate its significance within a larger framework of events and movements. It is our hope that this analysis underscores the vital role that historical heritage plays in fostering a sense of identity and collective memory within communities.

While Palm Villa may no longer have an active human presence, its historical heritage holds a rich family history for those whose forebears are from Palm Villa, or lived there at some point. This land's historical significance can contribute to creating unique and meaningful spaces that blend past and present. By incorporating elements of the land's heritage into development plans, such as adaptive reuse of existing structures, commemorative plaques, or interpretive exhibits, we can create a sense of place that respects the past while meeting the needs of the present. Additionally, leveraging the land's historical heritage can attract tourism and generate economic opportunities, benefiting local communities and fostering a sense of pride and identity. Balancing development goals with preservation efforts ensures that the land's historical legacy is not lost but instead becomes a valuable asset, enhancing the overall character and vitality of the area.

10. REFERENCES

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APPENDIX

Genealogy Reference

(to inform Family Tree at Figure 8)

John William Thompson *m. Deborah Sophia Thomspson* Born
June 9th, 1976 in The Creek, New Providence, Bahamas .
Children.

James Alexander Thompson *m. Deborah Ann Simms Thompson*
Born September 1827 in Long Island, Bahamas
Died July 22nd 1880 at age 52 in Simms, Long Island Bahamas
Children.

Malvina Matilda (Thomspon) Watson *m. 1874 Bruce Hayward Watson* ***(son of William Richard Watson and Louisa Maria Braddock Watson)***
Born July 12th 1854 in Long Island Bahamas | Bruce Watson born April 10 1846
Died April 7th 1945 at age 90 | Died April 29th 1916 in (Gordon's Long Island)
Nassau, New New Providence, Bahamas
Children.

Female Watson

Constance Frances Huldah (Watson) Knowles *m. Louis Philip Knowles* ***(First Marriage Mary Pricsilla Sawyer Knowles)***
Born June 5th 1875 in Mckenzie's Long Island | Louis Knowles born May 7 1837 (Eleuthera)
Died August 15th 1960 in Nassau New Providence | Died December 1st 1914 in (Nassau)

Louisa Ida Maria Watson

Frederica Watson

Sarah Watson

Mabel Watson

William Wallace Winder Watson

Frank Watson

Emma Watson

Children.

Frances Knowles,

Edith (knowles) Graham

Ronald Knowles (1901)

Constance Knowles

William Knowles

Louis Napoleon Knowles (1909)

***Ann Maria Knowles (*Louis and Mary)**

***John Henry Sawyer Knowles (*Louis and Mary) *Alice Gertrude Knowles (*Louis and Mary)**

***Louis Philip Knowles Jr. (*Louis and Mary)** *m. Teresita Carolina Arteage Knowles*

Born March 15 1869 in Nassau, New Providence, Bahamas

Died Before 1914

***Granville Christopher Knowles (*Louis and Mary)**

***Mary Knowles (*Louis and Mary)**

***Mary Knowles (*Louis and Mary)**

***Adele Knowles(*Louis and Mary)**

***Edmund Knowles (*Louis and Mary)**

***Ada Knowles (*Louis and Mary)**

Children of Louis Philip Knowles Jr. and Teresita Carolina Arteage Knowles

Mercedes Maria (1894-1922)

Louis Agramonte (1896-1982)

Ignatius Nacito "Cedar" Knowles (1898-1827)

Teresita Ann "Terry" Knowles (1900-1992)

Violet Delores (1902-1985)

Lois Phillipa Knowles (1905-1969)