



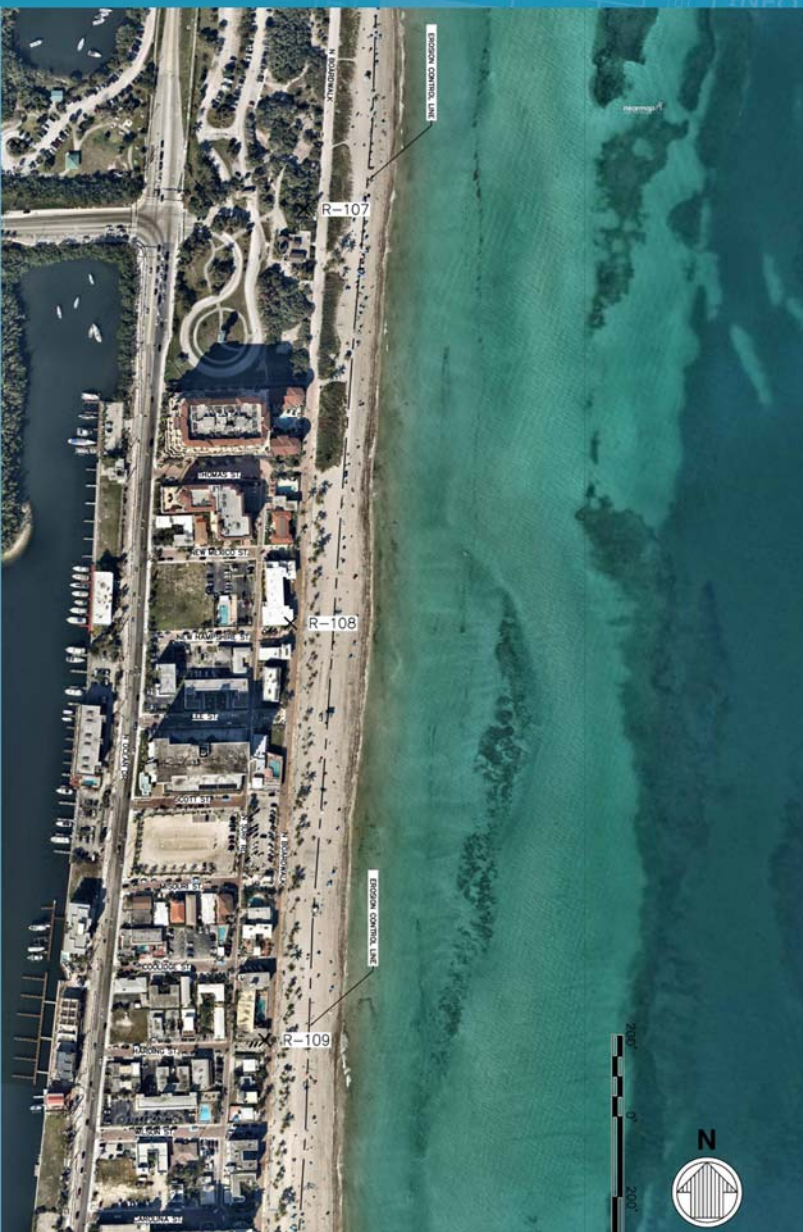
moFFatt & nichol

Dune Master Plan

Produced for City of Hollywood

Community Redevelopment Agency

January 2020



Document Verification

Client	City of Hollywood
Project name	City of Hollywood Dune Master Plan
Document title	Dune Master Plan
Document sub-title	–
Status	Report
Date	January 13, 2020
Project number	9496-01
File reference	\\mne.net\projects\MIA\9496-00\Reports\2019-08 Dune Master Plan (Narrative format).docx

Revision	Description	Issued by	Date	Checked
01	Report	L. Shepherd	July 2019	CJB
02	Modification to Incorporate Task Force Comments	L. Shepherd	September 2019	CJB
03	Modifications per City comments	L. Shepherd	November 7, 2019	CJB
04	Minor edits per City	L. Shepherd	January 22, 2020	CJB

Produced by:
Moffatt & Nichol
2937 SW 27 Avenue
Suite 101A
Miami, FL 33133
305-230-1924
www.moffattnichol.com



Table of Contents

Document Verification	ii
Table of Contents	iii
List of Figures	iv
List of Tables	v
Disclaimer	vi
Glossary	vii
1. Introduction	1
1.1. Statement of Purpose	1
1.2. Objectives	1
2. Dune Functional Values	2
2.1. Ecology	2
2.2. Storm Protection	2
2.3. Financial Value	2
3. Dune Management Zones	3
3.1. General Design Standards	3
3.2. Management of Existing Dune Zone	12
3.2.1. Characterization	12
3.2.2. Management Recommendations	12
3.3. Enhance Discontinuous Dune Zone	12
3.3.1. Characterization	12
3.3.2. Management Recommendations	13
3.4. Urban Dune Zone	13
3.4.1. Characterization	13
3.4.2. Management Recommendations	13
3.5. Chronically Eroded Beach Zone	15
3.5.1. Characterization	15
3.5.2. Management Recommendations	15
4. Dune Management Specifications	16
4.1. Beach Access	16
4.2. Dune Profile	16
4.2.1. Broward County Beach Nourishment	16
4.2.2. FEMA, Climate Change, and Resiliency	17
4.3. Dune Vegetation	18
4.3.1. Native Species	18
4.3.2. Irrigation	19
4.3.3. Non-Native Species	19
4.3.4. Maintenance	19
4.3.5. Timing	20
4.3.6. Regulatory	20
5. Next Steps	22



List of Figures

Figure 1A: Dune Management Zones4

Figure 1B: Dune Management Zones5

Figure 1C: Dune Management Zones6

Figure 1D: Dune Management Zones7

Figure 1E: Dune Management Zones8

Figure 1F: Dune Management Zones9

Figure 1G: Dune Management Zones10

Figure 1A: Dune Management Zones11

Figure 2: Urban Dune Typical Cross-Section.....14

Figure 3 – Broward County Segment II Beach Nourishment Typical Profile17



List of Tables

TABLE 1: Recommended Plant Palette..... 18



Disclaimer

Moffatt & Nichol devoted effort consistent with (i) the level of diligence ordinarily exercised by competent professionals practicing in the area under the same or similar circumstances, and (ii) the time and budget available for its work, to ensure that the data contained in this report is accurate as of the date of its preparation. This study is based on estimates, assumptions and other information developed by Moffatt & Nichol from its independent research effort, general knowledge of the industry, and information provided by and consultations with the client and the client's representatives. No responsibility is assumed for inaccuracies in reporting by the Client, the Client's agents and representatives, or any third-party data source used in preparing or presenting this study. Moffatt & Nichol assumes no duty to update the information contained herein unless it is separately retained to do so pursuant to a written agreement signed by Moffatt & Nichol and the Client.

Moffatt & Nichol's findings represent its professional judgment. Neither Moffatt & Nichol nor its respective affiliates, makes any warranty, expressed or implied, with respect to any information or methods disclosed in this document. Any recipient of this document other than the Client, by their acceptance or use of this document, releases Moffatt & Nichol and its affiliates from any liability for direct, indirect, consequential or special loss or damage whether arising in contract, warranty (express or implied), tort or otherwise, and irrespective of fault, negligence and strict liability.

This report may not to be used in conjunction with any public or private offering of securities, debt, equity, or other similar purpose where it may be relied upon to any degree by any person other than the Client. This study may not be used for purposes other than those for which it was prepared or for which prior written consent has been obtained from Moffatt & Nichol.

Possession of this study does not carry with it the right of publication or the right to use the name of "Moffatt & Nichol" in any manner without the prior written consent of Moffatt & Nichol. No party may abstract, excerpt or summarise this report without the prior written consent of Moffatt & Nichol. Moffatt & Nichol has served solely in the capacity of consultant and has not rendered any expert opinions in connection with the subject matter hereof. Any changes made to the study, or any use of the study not specifically identified in the agreement between the Client and Moffatt & Nichol or otherwise expressly approved in writing by Moffatt & Nichol, shall be at the sole risk of the party making such changes or adopting such use.

This document was prepared solely for the use by the Client. No party may rely on this report except the Client or a party so authorised by Moffatt & Nichol in writing (including, without limitation, in the form of a reliance letter). Any party who is entitled to rely on this document may do so only on the document in its entirety and not on any excerpt or summary. Entitlement to rely upon this document is conditioned upon the entitled party accepting full responsibility and not holding Moffatt & Nichol liable in any way for any impacts on the forecasts or the earnings from the project resulting from changes in "external" factors such as changes in government policy, in the pricing of commodities and materials, price levels generally, competitive alternatives to the project, the behaviour of consumers or competitors and changes in the owners' policies affecting the operation of their projects.

This document may include "forward-looking statements". These statements relate to Moffatt & Nichol's expectations, beliefs, intentions or strategies regarding the future. These statements may be identified by the use of words like "anticipate," "believe," "estimate," "expect," "intend," "may," "plan," "project," "will," "should," "seek," and similar expressions. The forward-looking statements reflect Moffatt & Nichol's views and assumptions with respect to future events as of the date of this study and are subject to future economic conditions, and other risks and uncertainties. Actual and future results and trends could differ materially from those set forth in such statements due to various factors, including, without limitation, those discussed in this study. These factors are beyond Moffatt & Nichol's ability to control or predict. Accordingly, Moffatt & Nichol makes no warranty or representation that any of the projected values or results contained in this study will actually be achieved.

This study is qualified in its entirety by, and should be considered in light of, these limitations, conditions and considerations.



Glossary

[illegible]

1. Introduction

1.1. Statement of Purpose

Dunes are part of Florida's coastal ecosystems providing economic, environmental and recreational benefit to the local community. The City CRA retained Moffatt & Nichol to prepare a Plan that addresses the dune maintenance and creation goals of the March 15, 2017, Hollywood Sustainability Action Plan. The Plan outlines a management approach that addresses both improvements to existing dune features and installation of new dunes / vegetation. The entirety of the City beach was evaluated, and the dunes categorized by physical/geographic characteristics and existing condition. The management approach was developed utilizing information obtained through onsite reconnaissance, input from City officials and staff, and initial regulatory agency outreach.

1.2. Objectives

The Plan focus is to foster projects that can have both immediate and long-term benefits, while also developing a feasible program in terms of design, permitting, and maintenance. In general, the Plan concentrates on the initial goals outlined below:

- Differentiate management zones based on current beach/dune features and adjacent upland use.
- Develop a plan to restore existing dunes to their original boundaries with characteristics from the appropriate management zone type.
- Create a maintenance standard and schedule for existing and new dunes.
- Prioritize new dune locations for storm protection, enhanced ecology/aesthetics, and increased property values.
- Provide typical topographic design profile for new dunes.
- Establish native salt-tolerant vegetation Recommended Palette for dune planting.
- Provide recommendations for further action items, studies, and/or assessments.
- Evaluate potential to create a “bank” mitigation credit program with the FDEP for completed dune restoration projects and maintain new dunes in their permitted templates.
- Discuss FDEP permitting instruments for Plan implementation.



2. Dune Functional Values

2.1. Ecology

Dunes are an important part of Florida's coastal ecosystems. The vegetated dune provides habitat to a distinctive subset of regional biota that is particularly well adapted to survive beach conditions (salt spray, periodic salt water inundation, periodic drought, soil erosion, dune migration, and harsh winds).

In addition, sea turtles come from all over the world to lay their eggs on Florida's beaches, one of only a handful of places in the world that sea turtles nest. Hollywood beaches support between 100-150 marine turtle nests annually. With sea turtles averaging 110 eggs per nest (hawksbill turtles producing the largest nests with over 200 eggs), thousands of hatchling turtles are produced each year.

2.2. Storm Protection

Vegetated coastal dunes provide storm protection by maintaining and supplying sand to beaches. Coastal dunes protect inland coastal areas from storm damage and flooding by coastal waves / elevated sea levels through the elevation and stored sand volume. In order to protect this function, coastal dune volume must be maintained while allowing the dune shape to conform to natural wind and water flow patterns.

Sea level rise increases the risk of coastal flooding; dunes are a viable option to minimize the effects of sea level rise. Beach dunes help prevent erosion caused by increased high tide and king tide events. Increased dune health and overall height also help to prevent breaches and overtopping from wave action that can cause washout of upland property and damage to upland structures, which range in value from ~\$300,000 to \$429,000,000 (values based on 2019 Property Appraiser data).

2.3. Financial Value

Florida beaches are visited by millions of people every year, both residents and out-of-town tourists, to enjoy the warm weather and temperate waters. Properties adjacent to healthy beach and dune systems typically enjoy increased financial value. Additionally, tourism associated with a healthy beach increases revenues for restaurants, hotels, other local businesses, which in turn translates to increased sales tax benefits to the community.

It is important to note that, per U.S. Census Bureau 2012 data, accommodation and food service sales within the City of Hollywood were >\$400MM.



3. Dune Management Zones

The existing beach / dune conditions were evaluated utilizing information obtained from onsite reconnaissance and aerial photography review. The varying conditions of the existing dune and adjacent upland uses were considered to establish management zones. These management zones are based on the presence / health of dune vegetation, continuous dune formation, width of the vegetated dune, and overall beach management goal of establishing a consistent City dune program for storm protection value, habitat health, and aesthetic value. These zones (as shown on the following aerials) and their associated conditions are the basis for their differing recommendations for long term management. The zones have been broken down as follows and can be viewed on Figures 1A through 1H:

- Maintenance of Existing Dune Zone (Orange Hatch).
- Enhance Discontinuous Dune Zone (Green Hatch).
- Urban Dune Zone (Purple Hatch).
- Chronically-Eroded Beach Zone (Blue Hatch).

3.1. General Design Standards

The following standards are recommended for dune preservation, maintenance, and creation based the review of available information, site investigations, and to address City-desired considerations of recreational beach width maintenance, habitat creation/improvement, aesthetics/view corridors, and increased storm protective value. The recommendations are based on the four Dune Management Zones identified within Figures 1A-1H (January 2019 Aerials).

Moffatt & Nichol assessed potential areas to provide /maintain a protective dune feature while preserving a recreational-use beach width. The overall area was reviewed for ideal beach conditions (i.e. wide beach for active use, healthy well established dune feature, etc.). Given an average width of the beach and dune system of 120 feet, a 2:1 ratio (beach:dune) is recommended, with a dune width of 40 feet (to be reduced, as required, to maintain recreational beach width), providing a recreational beach width of ~80 feet, which allows for utilization by a variety of user groups.

Additionally, the recommendations address the unique characteristics of the Broadwalk area while balancing shore protection / dune building goals. Where the Broadwalk is present, the Urban Dune design guidelines address the desire to limit overtopping of the knee-wall with fill / vegetation, maintain beach/ocean view corridors from the Broadwalk and adjacent upland businesses, and to create a protective dune feature when possible.

FIGURE 1A - DUNE MANAGEMENT ZONES



Source: Moffatt & Nicholl

FIGURE 1B - DUNE MANAGEMENT ZONES



Source: Moffatt & Nichol

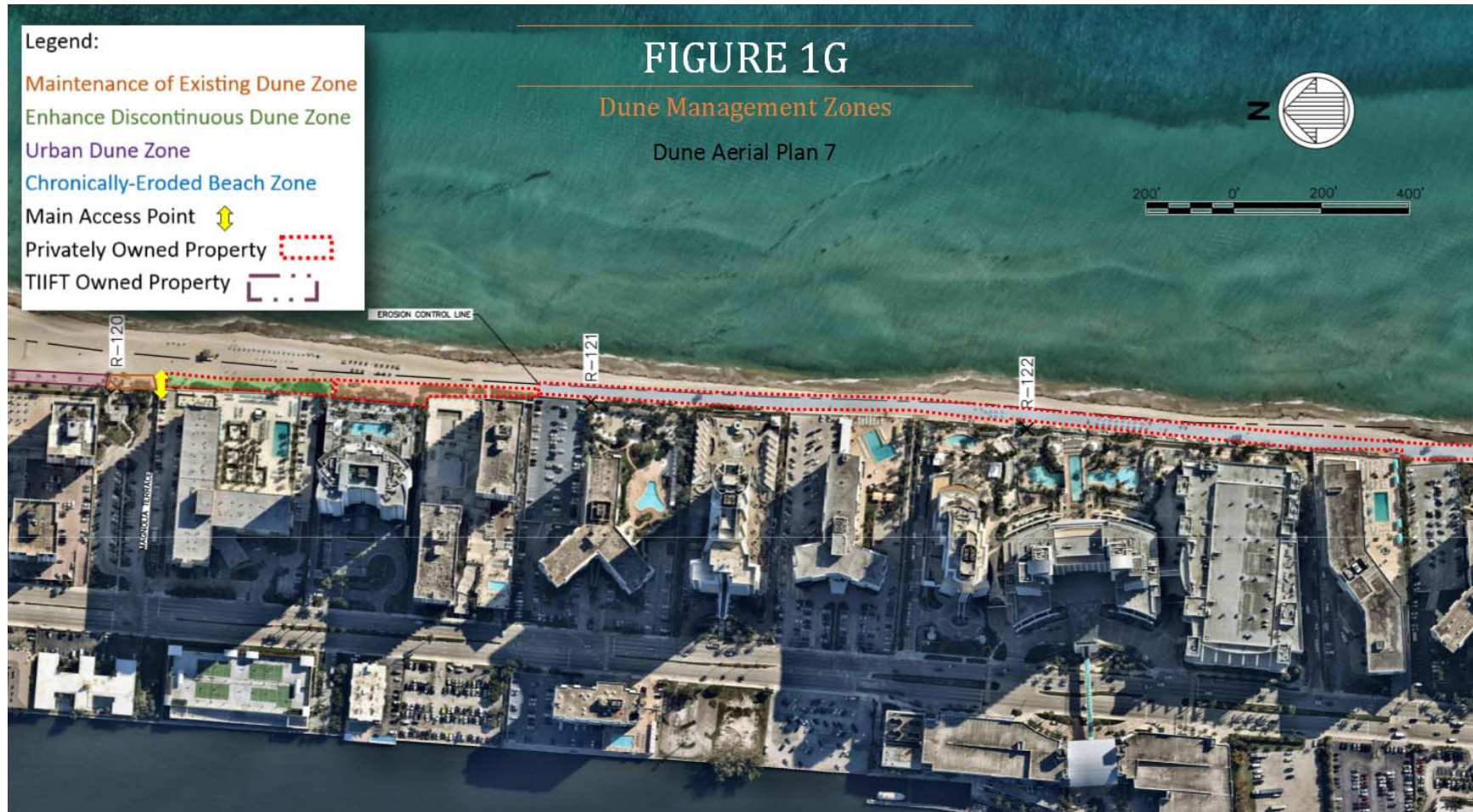


FIGURE 1F - DUNE MANAGEMENT ZONES



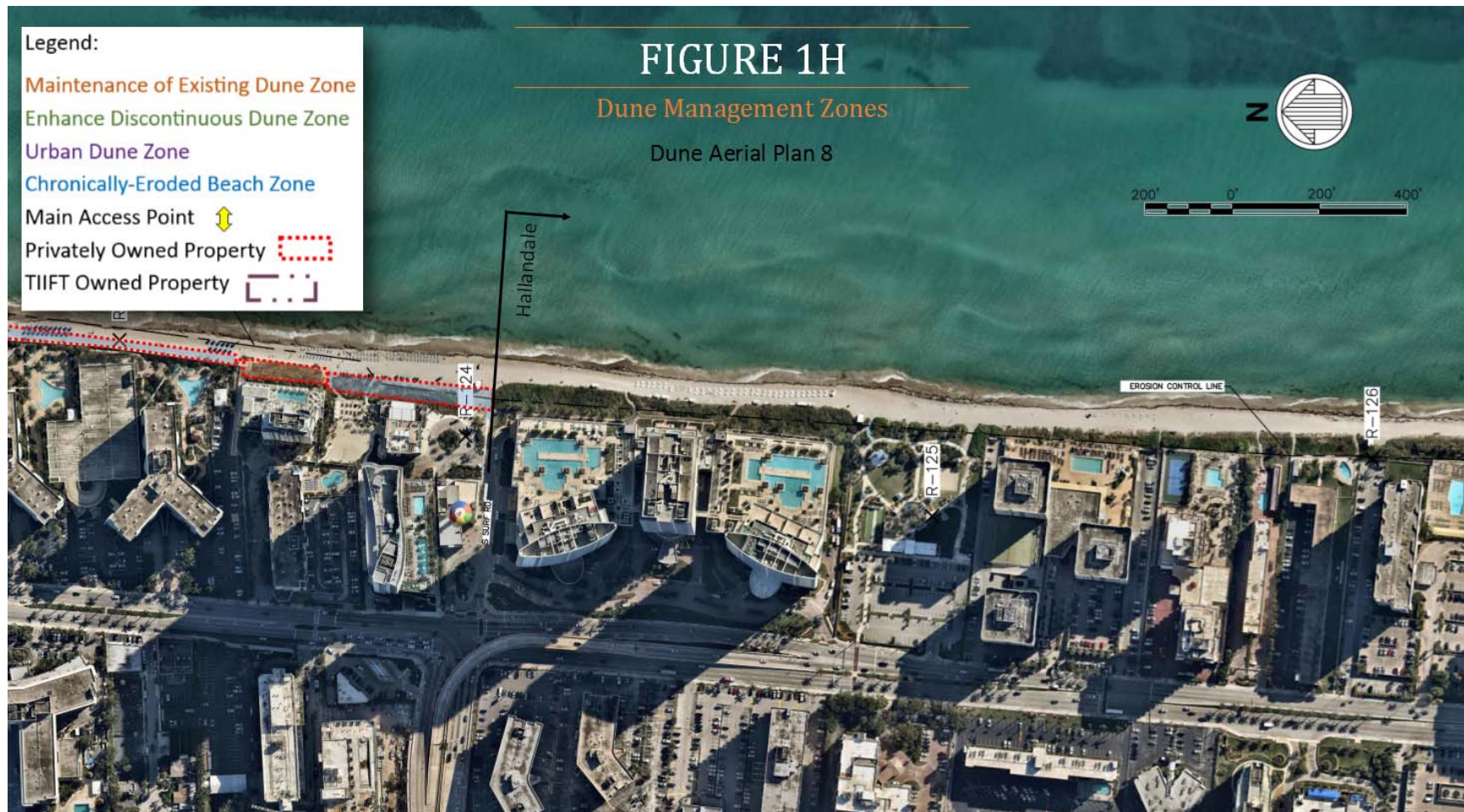
Source: Moffatt & Nichol

FIGURE 1G - DUNE MANAGEMENT ZONES



Source: Moffatt & Nichol

FIGURE 1H - DUNE MANAGEMENT ZONES



Source: Moffatt & Nichol

3.2. Management of Existing Dune Zone

3.2.1. Characterization

Large portions of the dune system consist of existing healthy, wide dunes (shown in orange hatch on the aerials located in Figures 1A through 1H). Typical characteristics include:

- Approximately 1.86 miles of the beach dune.
- Dune \geq 70 feet wide.
- Vegetation that is well established, usually mature, with consistent ground cover, and limited non-native species.
- Normally located in areas where the beach is approximately 80 feet wide, or wider.
- Have increased topography / dune volume compared to other areas of the beach / dune system.

3.2.2. Management Recommendations

The following management guidelines are proposed for the Existing Dune areas:

- Ensure post-and-rope fence is continuous around the dune to minimize pedestrian footpaths within the dune and vehicular erosion of the seaward edge of the dune.
- Remove excess vegetation in areas where the dune has expanded beyond the original eastern limit, thus reducing recreational beach to less than the target 80-foot minimum design standard. The Florida Department of Environmental Protection (FDEP) will require mitigation for removal; see Regulatory section for more details.
- In areas where the vegetation has overgrown major public beach access points, trim back the vegetation to provide approximately 6 feet of clearance. Refer to the Beach Access Section for further guidance.
- Remove non-native plant species. Large barren areas present after removal should be replanted with species selected from the Recommended Palette provided to prevent erosion or recolonization by non-native plant species.
- Coordinate with Homeless Outreach Program (HOP) to remove encampments within the dune.
- Prune or limb-up seagrape trees as necessary to provide “window-pane” views.
- Large scale maintenance events should be conducted between November 1st and March 1st (outside of marine turtle nesting season), as heavy equipment will likely be required. It is preferred that the activities be conducted within February, close to the beginning of Florida’s wet season.
- Semi-annual inspection events should be conducted thereafter with maintenance activities provided on an as-needed basis.
- A rough estimate of the annual maintenance costs associated with this segment range between \$103,200 and \$350,600, based on previous costs for similar projects.

3.3. Enhance Discontinuous Dune Zone

3.3.1. Characterization

Smaller portions of the existing dune system consist of discontinuous dunes (shown in green hatch on the aerials located in Figures 1A through 1H). Typical characteristics of the Enhance Discontinuous Zone include:

- Approximately 0.34 miles of beach dune.
- Disconnected dune sections / mounds.
- Inconsistent / patchy vegetation.
- Some non-native species.
- Normally located in areas where the beach is approximately 80 feet wide, or wider.
- Dune height is limited due to disconnect between features and patchiness of the vegetation.



3.3.2. Management Recommendations

The following management guidelines are proposed for the existing areas where sporadic dune segments are present:

- Create a continuous dune by proposing close-the-gap plantings between segments.
- Plant species should be selected from the Recommended Palette provided.
- Planting areas larger than 80 sf should utilize a minimum 3 plant species.
- Seaward edge planting should be largely in line with existing stable vegetation.
- Close-the-gap events should be conducted between November 1st and March 1st (outside of marine turtle nesting season), as heavy equipment will likely be required. It is preferred that the activities be conducted within February, close to the beginning of Florida's wet season.
- Propose fill to maintain consistent dune crest / elevation. Where fill is proposed, it will be consistent with the FDEP sand quality requirements noted within 62B-33.005(7), FAC.
- Propose post-and-rope fence around the dune.
- Evaluate management of beach in conjunction with proposed improvements (see Beach Access section).
- In areas where the vegetation has overgrown the existing beach access points, trim back the vegetation to provide approximately 6 feet of clearance.
- Non-native species should be identified and removed. If large barren areas are present after removal, or if required by the FDEP, they should be replanted to prevent erosion or recolonization by non-native plant species.
- Semi-annual inspection events should be conducted thereafter with maintenance activities provided on an as-needed basis.
- Estimated costs based on previous costs provided by Public Works for similar projects are:
- Initial invasive species removal and close-the-gap activities: \$156,000.
- Annual maintenance costs range between \$7,200 and \$24,450.

3.4. Urban Dune Zone

3.4.1. Characterization

Two large segments of beach within the City are substantially wide enough to support the presence of a dune, where a dune does not currently exist (shown in purple hatch within Figures 1A through 1H). The main segment is adjacent to the City Boardwalk, where maintaining historical view corridors has been a priority. The other segment is located in the vicinity of Foxglove Terrace and Magnolia Terrace. Typical characteristics include:

- Approximately 1.85 miles of the beach dune.
- Vegetation limited to palm trees and minimal patches of grass or ground cover.
- Beach width typically \geq 120 feet.
- Boardwalk knee wall or bulkhead is west border.
- High pedestrian traffic area.

3.4.2. Management Recommendations

Vegetated dune creation within the Urban Dune zone is recommended, along with the following management guidelines:

- Provide planting along the Urban Dune zone to stabilize windblown sand. Plant species should be selected from the Recommended Palette provided. Vegetated dune width is recommended to be a maximum of 40 feet.
- Maximum height of dune is 6" below top of City knee-wall.
- Dune planting to be offset 10' from knee-wall.
- Install post-and-rope fence around the dune.



- Given the proximity to the low City knee-wall, no fill is proposed. Sand trapping will occur over time and it is recommended that a maximum dune height and footprint be approved by the FDEP that will allow the City to conduct sand removal maintenance. Refer to Regulatory section for more detail.
- Additional Police presence may be required to observe the beach area. Safety and security concerns should be monitored and adjustments made to the plan (vegetation trimming, police monitoring plan, emergency access clearance) as needed.
- Establish beach access points through the dune based on City and Police preferences. Refer to Beach Access section for design guidance.
- Dune creation / layout to include coordination with Parks, Recreation and Cultural Arts department to address concession location.
- Non-native species are present should be removed prior to planting activities.
- Dune creation activities should be conducted between January 1st and March 1st (outside of marine turtle nesting season), as heavy equipment will be required.
- Semi-annual inspection events should be conducted thereafter with maintenance activities provided on an as-needed basis.
- Estimated costs assuming dune throughout the area and based on previous costs provided by Public Works for similar projects are:
 - Initial dune creation activities: \$845,000.
 - Annual maintenance costs range between \$39,000 and \$132,850.

FIGURE 2 – URBAN DUNE TYPICAL CROSS-SECTION



Moffatt & Nichol

3.5. Chronically Eroded Beach Zone

3.5.1. Characterization

The southern segment of the City beach includes a narrow beach with limited vegetation (shown in blue hatch on the aerials located in Figures 1A through 1H). Typical characteristics include:

- Approximately 0.55 mile of the beach.
- Beach/dune terminates at landward seawall.
- Vegetation limited to minimal patches of grass or other ground cover adjacent to bulkhead structures.
- Beach width typically ≤ 80 feet.
- Area subject to:
 - Higher erosion.
 - Escarpment creation.
 - Vegetation washout (where present).

3.5.2. Management Recommendations

The Chronically-Eroded Beach Zone is subject to erosion and escarpment creation on a cyclical basis. Given the narrow nature of this portion of the beach, foot traffic and maintenance vehicle impacts to proposed vegetation must be reviewed. Until such time as a full beach nourishment is completed, which will potentially support construction of a wider dune, minimal vegetation improvements are proposed. As such, the following outlines the recommendations for the Chronically Eroded Beach Zone:

- Planting should prioritize Pioneer Zone species (see Recommended Palette) with greater tolerance for salt water inundation and salt spray.
- Dune width should be adjusted at the 2:1 ratio of beach-to-dune width previously mentioned.
- Given the dynamic nature of this portion of the beach, post-and-rope fence should not be proposed.
- Beach access through the vegetation should be at an angle (northwest to southeast, where possible) to assist in preventing storm surge impacts to upland properties.
- If any non-native species patches are present, they should be removed.
- Estimated initial dune creation costs, assuming minimal dune throughout the area and based on previous costs provided by Public Works for similar projects, are \$93,000 to 116,200.
- Estimated of annual maintenance costs range between \$2,350 to \$9,875.



4. Dune Management Specifications

4.1. Beach Access

Public beach access points exist throughout the City's beach and dune system.

The main points used by the City for vehicular / emergency access to the beach are shown as yellow arrows on the aerials located in Figures 1A through 1H.

The conditions of the access points vary greatly depending on location and condition of the adjacent dune - from narrow overgrown vegetated corridors to wide sand expanses that cause windblown or over-washed sand to move onto the landward sidewalk and/or street.

The following guidelines address Beach Access management throughout the preceding segments of the City beach:

- Unnecessary footpaths should be closed with vegetation planting to minimize the potential for storm-related breaches of the protective dune feature.
- New access points should be installed at an angle (see upper right photo) to prevent windblown sand and dune breaches / channelling of storm surge onto upland property.
- Beach access paths can, as appropriate, be augmented with an independent vegetation buffer (see bottom photo to right) at the seaward endpoint, provided that the target recreational beach width is maintained. This will also assist in the prevention of windblown sand / surge impacts to upland property during coastal storm events.
- Public access point widths should be maintained at 6 feet.
- Emergency vehicular access points, as designated by the City, should be maintained at a minimum 10 feet width.
- Access points narrowed by overgrowth should be cut back and trees limbed up when possible.

4.2. Dune Profile

4.2.1. Broward County Beach Nourishment

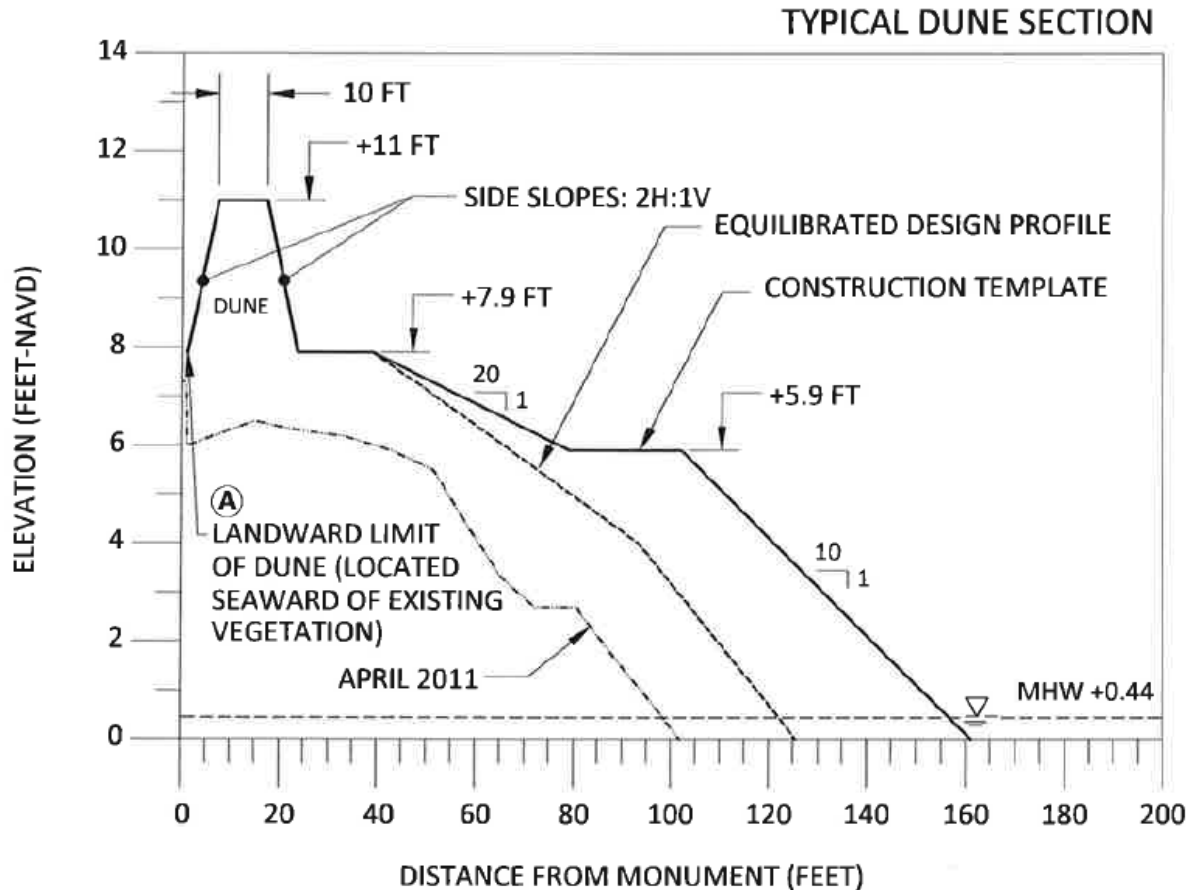
Broward County beach nourishment activities are planned in the future for the City of Hollywood's beach. This beach nourishment segment (Segment III, which in 2005 ran from Miami-Dade/Broward County Line to John U. Lloyd State Park) is anticipated to include a dune. As a starting point for dune design, Broward County will reference to Segment II beach nourishment project in Fort Lauderdale (permitted by the FDEP under Joint Coastal Permit No. 0314535-001-JC). Figure 3 illustrates a typical beach / dune cross-section of Segment II that can be anticipated for Segment III in Hollywood. The profile includes:

- A dune crest width of ~10 feet*.
- A dune crest maximum height of +11.0 feet NAVD*.
- Dune side slope of 2:1.
- A beach slope of 20:1.

**It is recommended that the City/CRA actively participate in the Segment III project design process with the County, reviewing the dune crest height and width, in particular, for that area adjacent to the Boardwalk given the low elevation of the adjacent knee wall and potential view corridor concerns.*



FIGURE 3 – BROWARD COUNTY SEGMENT II BEACH NOURISHMENT TYPICAL PROFILE



Source: Broward County Shore Protection Project Segment II—FDEP Approval Package Sheet 21 of 21 (Permit #03114535-001-JC)

4.2.2. FEMA, Climate Change, and Resiliency

FEMA's National Flood Insurance Program (NFIP) issues Flood Insurance Rate Maps (FIRM) that define flood zones with types and degrees of flood risk. The NFIP recognizes the importance of dunes in reducing coastal flood hazards. The NFIP defines a primary frontal dune as a continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward of and adjacent to the beach. Primary frontal dunes are subject to erosion and may be vulnerable to overtopping or breaching from high water levels and waves during coastal storms.

The landward toe of a primary frontal dune is located at the point where there is a distinct change from a relatively steep slope to a relatively mild slope. The V, V1-30, or VE Zone is extended inland to the landward primary frontal dune toe, which establishes the minimum landward limit of the Coastal High Hazard Area. V, V1-30, or VE Zone limits are also defined by the area subject to wave heights between 1.5 and 3 feet during the base flood condition.

A continuous, well-established vegetated dune can influence the location of the V, V1-30, or VE Zone, which could have a direct impact on upland property owner's flood insurance cost and new/improved building design options. AE flood zones can potentially allow for new or substantially renovated buildings to have a closer

context with existing historical structures, as structures in the V, V1-30, or VE Zone often must be elevated above the ground on pilings. Additionally, flood insurance rates for structures in AE flood zones are typically lower than in V, V1-30, or VE Zones. A study is recommended to analyze the extent to which beach nourishment, dune construction, Boardwalk elevation, and/or wave-break wall construction may be required to process a FEMA Letter of Map Change (LOMC) to change the VE zone for the oceanfront line of properties to an AE zone. Broward County's FIRM are currently being updated, and it is recommended that the LOMC feasibility study be done after new 100-year storm surge elevation data is released by FEMA (anticipated Spring/Summer 2020).

Estimates timeframe for processing of a LOMC application, as described above, is as follows:

- Creation / Establishment of dune feature (1.5-2 years)
- Preliminary analysis for flood zone map revision based on established dune feature (3 months)
- Map Change application and processing (6-8 months)
- Access points narrowed by overgrowth should be cut back and trees limbed up when possible.

4.3. Dune Vegetation

4.3.1. Native Species

Dune vegetation should be selected based on appropriateness for the proposed location, both within the State of Florida and within the footprint of the dune. The Recommended Plant Palette (Table 1) includes species native to the region, salt tolerant, drought tolerant, and tolerate low soil nutrients. Please note that recommended species do not preclude other native salt tolerant species from being proposed within the dune. A planting plan should be submitted for review / approval by City staff and the FDEP under the Coastal CCCL permitting program. Commonly-occurring species observed within the City's dunes include:

- Railroad vine (*Ipomoea pes-caprae*)
- Sea oats (*Uniola paniculata*)
- Seagrape (*Coccoloba uvifera*)
- East coast dune sunflower (*Helianthus debilis*)
- Sabal palm (*Sabal palmetto*)

TABLE 1 – RECOMMENDED PLANT PALETTE

Plant Common Name	Plant Scientific Name	Dune Location	Plant Height	Type	Availability
Beach bean	<i>Canavalia rosea</i>	Incipient	6-12 in	groundcover	Native Plant Nurseries
Railroad vine, bayhops	<i>Ipomoea pes-caprae</i>	Incipient	3-9 in	vine	Widely available
Sea oats	<i>Uniola paniculata</i>	Incipient, Fore	3-4 ft, 6 ft flowering	grass	Widely available
Seashore paspalum	<i>Paspalum vaginatum</i>	Incipient, Fore	6-12 in, 2 ft flowering	grass	Native Plant Nurseries
Saltmeadow cordgrass	<i>Spartina patens</i>	Fore	2-3 ft, 4 ft flowering	grass	Widely available
Sea lavender, Sea rosemary	<i>Tournefortia gnaphalodes</i>	Fore	3-6 ft	shrub	Native Plant Nurseries
Beach elder	<i>Iva imbricata</i>	Fore	2-3 ft	shrub	Native Plant Nurseries

Golden-creeper	<i>Ernodea littoralis</i>	Fore, Hind	1-3 ft	shrub	Native Plant Nurseries
Dune sunflower	<i>Helianthus debilis</i>	Fore, Hind	1-2 ft	shrub	Widely available
Perfumed spiderlily	<i>Hymenocallis latifolia</i>	Hind	2-3 ft	perennial	Widely available

4.3.2. Irrigation

Irrigation should be included only for those areas where new vegetation is proposed. Existing, established dunes should not be irrigated. If they have existing irrigation systems, it is recommended that they be removed to prevent accelerated growth. Irrigation should be provided until new vegetation is established, which is typically 6 months. Irrigation frequency is recommended daily for first 2 weeks, every other day for the following 2 months, then weekly until established. Irrigation can be provided by the following two methods:

Temporary Irrigation System: An on-grade temporary irrigation system may be proposed for large areas of dune planting. As noted, a temporary irrigation system is located on grade, typically of a low cost PVC pipe system, which can be removed once vegetation growth is established.

Manual Irrigation: For discrete areas of planting, manual irrigation utilizing a water truck is recommended.

4.3.3. Non-Native Species

Non-native, or invasive/exotic, plant species have an adverse effect on native plant communities, including loss of native plants due to non-native plant infestations and alteration of endangered species habitat. Non-native plant species can destabilize a dune community, resulting in reduced storm resilience. Non-native species should be completely removed from the dune when observed.

Non-native species observed during recent city-wide dune inspections include:

- *Scaevola taccada* (half-flower or beach naupaka)
- *Sphagneticola trilobata* (Wedelia trilobata, wedelia, or creeping oxeye daisy)

Other non-native species commonly found within South Florida's dune system include:

- *Casuarina equisetifolia* (Australian pine)
- *Schinus terebinthifolius* (Brazilian pepper)

4.3.4. Maintenance

A comprehensive dune maintenance plan should be developed with input from the City Public Works Department to include the following:

- Semi-annual dune inspections to:
 - Identify non-native species for removal.
 - Identify vegetation overgrowth for removal beyond dune boundaries, including vegetation height, and into walkways.
 - Assess damage to post and rope for replacement/repair.
 - Evaluate mature trees for potential "limbing up."
 - Replanting of native, dune species where large areas of non-native species have been removed.
 - Contractual maintenance should be done by a qualified vendor.
- Exotic species removal within the dune should include the root system to avoid regrowth.
- Frequency of trash removal from dune areas.
- Post Storm Action Plan (assessment / maintenance to remove broken / dead tree limbs, removal of storm debris, repair damage to post and rope border, etc.).



4.3.5. Timing

As noted previously, large scale projects requiring heavy equipment should be conducted between November 1st and February 28th, outside of marine turtle nesting season, as the FDEP will likely prevent or limit the use of heavy equipment on the nesting beach during this period. It is recommended that the projects be implemented close to the end of February to take advantage of South Florida's wet season, which will help establish the plants, reducing watering needs. Semi-annual inspection events of all dune areas should be conducted thereafter with maintenance activities provided on an as-needed basis. It is recommended that the results of the initial (3-4) inspection events be tracked closely and inspection frequency re-evaluated based on those results.

4.3.6. Regulatory

FDEP CCCL permit approvals for beach dune improvements are required. Activities are not anticipated on state-owned lands seaward of the ECL. Below are options available for permitting of the proposed activities.

- A FDEP Field Permit may be obtained for planting of dune species and non-exempt trimming. The FDEP may issue Field Permits for the construction of limited minor structures (such as a wood gazebo), improvements, or activities, including the placement of beach-compatible sand fill up to 200 cubic yards.
- Activities that are not exempt from FDEP CCCL permitting criteria and do not qualify for authorization under a Field Permit are required to obtain a formal FDEP administrative permit (a CCCL Permit). One form of CCCL permit is the Area Wide Permit that may be granted to local municipalities for special classes of activities in areas under their general jurisdiction or responsibility, if these activities will not cause a measurable interference with the natural functioning of the beach-dune system or with marine turtles or their nesting sites. Such activities include dune restoration and access for enhancing accessibility. A FDEP Area Wide Permit can be sought for beach planting and removal, and potentially other dune maintenance activities.
- Pursuant to initial discussions with FDEP staff, it may be possible for the City to use an instrument, such as an Area Wide Permit to secure approval for the construction and maintenance of a specific dune template (with defined maximum height/elevation, width, seaward limit).
- It is recommended that the City negotiate conditions under the Area Wide Permit(s) that will allow for ongoing maintenance of dune topography and vegetation limits/heights for the life of the permit (5 years), as well as for extensions or reissuance of subsequent permits.
- The concept of “banking” dune improvements as mitigation for future City projects that require mitigation (such as removal of dune vegetation that is growing onto the recreational beach, expansion of the Boardwalk seaward, etc.) was discussed with the FDEP. The FDEP raised questions with regard to the procedure / format in which this could be tracked, and noted that site/project-specific assessment would be required. Further discussions with the FDEP are recommended, in general and/or specific to potential upcoming projects.
- Alternatively, the City may want to explore developing a Beachfront Management Agreement (BMA) with the State of Florida, under Section 403.0752, F.S. BMAs are established between the City and the Board of Trustees of the Florida Internal Improvement Trust Fund, transferring management of State lands to the City for use as a public beach area for recreational and other related activities. BMAs are adaptable and amendable (regularly reviewed / approved every 10 years). They provide a holistic approach to beach / dune management, typically including the following types of activities:
 - Beach/Dune Vehicular Access (Beach patrol, beach raking, waste management, wrack line management, etc.).
 - Property Management (lifeguard stands, signage, etc.).
 - Erosion control monitoring and management.
 - Special event management and oversight.
 - Natural resource management and restoration.
 - Beach access management (Boardwalk, beach access points, ADA improvements, etc.).



- Note that exempt activities include, but may not be limited to, the following (consultation with FDEP staff to affirm exemption is recommended):
 - Maintenance of existing beach-dune vegetation.
 - Burial of seaweed on the unvegetated beach.
 - Removal of piers or other derelict structures from the unvegetated beach or seaward of mean high water line.
 - Temporary emergency vehicular access, if the affected area is immediately restored.
 - Removal of existing structures or debris from the upland, if there is no excavation or disturbance to the existing topography or to beach-dune vegetation.
 - Minor and temporary excavation for the purpose of repairs to existing subgrade residential service utilities (e.g., water and sewer lines, septic tanks and drainfields, electrical and telephone cables, and gas lines), if there is minimal disturbance and the grade is restored with compatible fill.
 - Beach or deck furniture.
 - Tie-downs, or anchors to existing minor structures or trees.
 - Portable public lifeguard stands.
 - Mono-post structures (umbrellas, signage, etc.) provided there is minimal disturbance to the beach and dune system, no damage to vegetation, and the grade is restored.
 - Minor recreational diggings and other forms of art on the unvegetated beach provided there is no removal or filling of sand.
 - Removal of windblown sand from paved roads and parking areas, beach access ramps, pools, patios, walkways, or decks not involving a change in the general grade and provided that any beach quality sand is returned to the beach and dune system.
 - Minor maintenance of bulkheads and seawalls specifically involving scraping, chipping, sandblasting, guniting, and painting.
 - Placement of temporary water pipes or hoses utilized for flood relief, provided that any such pipes or hoses are placed on the ground surface and do not damage dune topography or native vegetation, and provided that no discharge occurs landward of the shoreline.
 - Temporary excavation for the inspection of coastal armoring structures on the seaward side, provided that it is limited to non-vegetated areas, occurs outside of marine turtle nesting season, is limited to the minimum area and volume required for the inspection, and the site is restored after the inspection.

5. Next Steps

- Conduct a detailed inventory of existing dunes, utilizing GIS or a formal topographic / boundary survey, to identify the existing dune footprint, topography, and native vs. non-native plant composition.
- Prepare a plan and associated budget with evaluation of phasing/priorities for maintenance of the existing dunes identified by the detailed survey, including costs for removal of non-native plants / replanting barren areas, installation of new post and rope barriers where they currently do not exist or are in poor condition, etc.
- Prepare a plan for installation of new dunes, analyzing areas where new dunes may be placed with associated budget and evaluation of phasing/priorities. The plan should include conceptual design drawings based on survey data, a planting palette based on preferred species, and cost estimates for plants / installation. The plan should take into account those areas where wind-blown sand and flooding are a consistent issue on the Broadwalk, sidewalks, and streets.
- Prior to installation of new dunes, a plan and budget should be prepared based on the design plans for future costs of the new dune maintenance.
- Evaluate potential FEMA flood insurance rate map change for coastal area; initial coastal engineering analysis.
- Explore the creation of a Beach Maintenance Fund to support dune creation and maintenance activities.
- Conduct further discussions with the FDEP regarding potential approval for dune construction/improvements via an Area Wide Permit or other mechanism with long-term maintenance of a maximum footprint/profile and mitigation banking credit to be used to offset beach-dune system impacts associated with other future projects.
- Evaluate development of a Beach Management Agreement with the State of Florida for holistic beach and dune management.
- Explore development of a “dune adoption” program that would allow upland properties owners the option to manage their adjacent dune to City standards.
- Engage neighbouring government representatives (Dania Beach and Hallandale Beach) in regional workshops to evaluate possible coordinate / partnership opportunities.
- Evaluate updating the City of Hollywood Landscape Manual to cross-reference the Dune Master Plan.

End Note:

The Dune Master Plan is a living document to be adjusted as needed to address changing conditions, including sea level rise policies that may be adopted in the future.





2937 SW 27 Avenue
Suite 101A
Miami, FL 33133
T (305) 230-1924

www.moffattnichol.com