

Natural Resources Evaluation

Florida Department of Transportation

District Six

VENETIAN CAUSEWAY

Limits of Project: FROM NORTH BAYSHORE DRIVE TO PURDY AVENUE

Miami-Dade County, Florida

Financial Management Number: 422713-2-22-01

ETDM Number: 12756

August 22, 2019

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by FDOT pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated December 14, 2016 and executed by FHWA and FDOT.

Executive Summary

The Florida Department of Transportation (FDOT) has conducted a Project Development and Environment (PD&E) Study to address identified structural and functional deficiencies of the 12 existing bridges that comprise the Venetian Causeway. The Causeway traverses over Biscayne Bay and connects the mainland of the City of Miami to the City of Miami Beach and is owned/operated by Miami-Dade County (County). The study includes the development, evaluation, and documentation of detailed engineering and environmental studies, which involves data collection, corridor analyses, conceptual design analyses, environmental analyses, public involvement, and project documentation.

This Natural Resources Evaluation (NRE) Report contains detailed information pertaining to threatened and endangered species within the project limits, existing jurisdictional wetland features throughout the project limits, Essential Fish Habitat (EFH) and avoidance and minimization measures for any potential impacts. A Protected Species and Habitat evaluation was conducted to document potential project involvement with threatened, endangered and/or protected species that may result from the structural improvements to the Venetian Causeway. This assessment was conducted in accordance with Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.) and the FDOT PD&E Manual. In addition, this NRE includes a Wetland and Surface Waters Evaluation which was conducted pursuant to the criteria specified in the FDOT PD&E Manual. An EFH analysis pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), as amended, and the FDOT PD&E Manual, was also conducted.

Through the Efficient Transportation Decision Making Environmental Screening Tool (ETDM EST), this project has been coordinated with National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) to assess impacts to EFH. Avoidance and minimization measures will be taken when feasible to avoid impacts to environmental resources (i.e. marine resources, threatened and endangered species). Furthermore, coordination with all necessary local, state and federal agencies has occurred to validate avoidance and minimization methods. All best management practices are implemented to reduce effects to threatened and endangered species, wetlands, and surface water features, and specific commitments by FDOT are made. Lastly, all necessary permits are identified for application prior to construction.

Protected Species and Habitat Evaluation

This NRE describes the likelihood of occurrence and potential for impact to federally and state listed species and their suitable habitats. Database searches, Geographic Information System (GIS) analysis and field investigations were conducted to determine occurring and potentially occurring protected species and their habitats within the corridor.

A total of 13 species (1 plant, 2 birds, 1 mammal, 6 reptiles, 1 fish, and 2 corals) that are federally and/or state listed were determined to occur or potentially occur within the project area. No direct impacts to any of these listed species are anticipated as a result of the project for any of the proposed alternatives. The project occurs within both Johnson's seagrass (*Halophila johnsonii*) and West Indian manatee (*Trichechus manatus*) critical habitat. However, impacts will be avoided to the greatest extent possible for each critical habitat and the effect determination for both species and their critical habitat is "may affect, not likely to adversely affect" (MANLAA). Given that the work consists of bridge improvements over a

marine ecosystem, several marine species have the potential to occur within the study area. By implementing avoidance and minimization techniques, along with Best Management Practices (BMPs), and Standard Protection Measures, the FDOT made an effect determination of MANLAA for the following species: Johnson's seagrass, West Indian manatee, American crocodile, Green sea turtle, Loggerhead sea turtle, Kemp's Ridley sea turtle, Leatherback sea turtle, Hawksbill sea turtle, Smalltooth sawfish, Elkhorn coral, and Staghorn coral. The effect determination for both bird species with the potential to utilize the project study area (Wood stork and Piping plover) is "no effect" as no suitable habitat exists within the project footprint. The overall impacts to species and their habitats in the project study area is determined to be minimal.

Wetlands and Surface Water Evaluation

Pursuant to Executive Order 11990 entitled "Protection of Wetlands," (May 1977) the U.S. Department of Transportation (USDOT) developed a policy, Preservation of the Nation's Wetlands (USDOT Order 5660.1A), dated August 24, 1978, which requires all federally funded highway studies to protect wetlands to the fullest extent possible. The Wetland and Surface Water evaluation performed for this project identified two surface waters (OSW 1 and OSW 2) and four natural and/or jurisdictional wetlands within the project corridor (W1, W2, W3, W4). None of these surface waters or wetland features are anticipated to be permanently impacted by the project. The most notable surface water is Biscayne Bay (OSW 2). This water body contains critical habitat for two protected species (Johnson's seagrass and West Indian manatee) and has been designated an Outstanding Florida Water (OFW). Due to the presence of critical habitat in this OFW, avoidance and minimization techniques will be implemented to reduce impacts to this water body. Although there are isolated wetland features identified within the project study area, they are generally outside of the specific work areas (See Appendix H) and are not anticipated to be impacted.

Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act established a new requirement to identify and describe EFH in order to protect, conserve and enhance EFH for the benefit of the federally managed fisheries. The project has potential to impact EFH and species within associated Fisheries Management Plans (FMPs) which have been developed by the South Atlantic Fisheries Management Council (SAFMC). Therefore, an EFH assessment, which included in-water biological characterization surveys (conducted in August 2014 and again in July 2017) around each of the 12 project bridges, was performed for the project area within Biscayne Bay. The following seven (7) EFH types were identified within the project area and are listed below with their associated FMPs: Estuarine & Marine Submerged Aquatic Vegetation (SAV) (Shrimp, Red Drum, Snapper-Grouper, and Spiny Lobster FMPs); Unconsolidated Bottom (Red Drum, Snapper-Grouper, and Spiny Lobster FMPs); Live/Hardbottom (Snapper-Grouper and Spiny Lobster FMPs); Shallow Subtidal bottom (Spiny Lobster FMP); Sponges (Spiny Lobster FMP); Algal Communities (Spiny Lobster FMP); Rough, hard, exposed, stable substrate (Coral FMP).

Regardless of the design alternative, no direct or indirect impacts to Estuarine and Marine SAV EFH are anticipated as these resources were located outside the anticipated work zone and were all found at deep enough depths that would not be impacted by barge routes. Additionally, barge spudding will only occur in the areas in close proximity to the bridges during construction to avoid unnecessary impacts to SAV. As this EFH type will not be adversely impacted, no impacts would be expected to the FMP for the Red Drum.

Temporary direct impacts to the following EFH types are anticipated due to the project during construction: Unconsolidated bottom, Live/Hardbottom, Sponges, Algal Communities and Rough, hard exposed stable substrate. Impacts to these EFH types may potentially affect species within the following FMPs: Shrimp, Snapper-Grouper, Spiny Lobster and Corals. All corals and barrel sponges in the area of potential impact will be inventoried and those suitable will be relocated prior to construction; this will alleviate any potential impacts to species within the Corals FMP. Temporary displacements of species included in the Shrimp, Spiny Lobster and Snapper-Grouper FMPs may occur during project construction; however, these species would all be anticipated to return to the project area post-construction as the EFH types that currently exist within the construction limits are anticipated to naturally re-establish. Therefore, no impacts to species within the Shrimp, Spiny Lobster or Snapper-Grouper FMPs are anticipated from this project.

Adverse impacts to EFH are anticipated to be 'Minimal' from this proposed project as they are generally anticipated to be temporary displacements with no substantial loss or degradation of any EFH or Habitat Area of Particular Concern (HAPC). Additionally, no species within any of the FMPs regulated by the SAFMC are anticipated to be adversely impacted due to the small size of the project and the minor, temporary nature of the anticipated EFH impacts. Temporary displacements of individuals within the species included in the aforementioned FMPs will be minimized through sequential construction methodology in which only one (1) project bridge is being impacted at a time. No long-term, adverse impacts are anticipated for the geographically designated, marine HAPC, Biscayne Bay as a result of this project as the proposed work is not expected to promote new development, decrease water quality or encourage changes in existing/future land use. Therefore, it is anticipated that cumulative impacts to EFH from the proposed project, when combined with other past, present and future projects, would be inconsequential.

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1.0 PROJECT SUMMARY

The Florida Department of Transportation (FDOT) District 6 has conducted a Project Development & Environment (PD&E) Study to address identified structural and functional deficiencies of the 12 existing bridges (Bridge Nos.: 874460, 874465, 874466, 874471, 874473, 874474, 874477, 874481, 874472, 874461, 874463 and 87445) that comprise the Venetian Causeway. The Causeway is owned by Miami-Dade County (County). Potential alternatives include replacement or rehabilitation of the bridges.

This Natural Resource Evaluation (NRE) Report was prepared in accordance with the FDOT PD&E Manual. The purpose of this evaluation is to document potential project involvement with wetlands and other surface waters (OSW), Essential Fish Habitat (EFH) and protected species and habitat. The following information is provided to determine the anticipated effects that the proposed improvements will have on wetlands and OSW in accordance with the Rivers and Harbors Act and Clean Water Act (CWA); EFH pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), as amended; and federal and State endangered or threatened species in accordance with Section 7(c) of the Endangered Species Act of 1973 (ESA) as amended, and the Florida Endangered and Threatened Species Act, Section 379.2291, Florida Statutes (F.S.).

1.1 Project Background

The Venetian Causeway is classified as an urban minor arterial road in Miami-Dade County, and is a significant transportation route connecting the City of Miami with the City of Miami Beach in Miami-Dade County, Florida. The current Causeway follows the original route of the Collins Bridge, a wooden structure built in 1913. The bridges along the causeway were originally built in 1926 with an anticipated design life of 50 years.

Between 1996 and 1999, the twelve causeway bridges underwent major rehabilitation that included the concrete arched beams, decks, foundations and the full replacement of all sidewalks and railings. The rehabilitation and repairs to the concrete elements were anticipated to last for ten years. As part of the rehabilitation, the east bascule bridge (Bridge 10) movable span and machinery was replaced. Spans 17 through 41 of the west bascule bridge (Bridge 1), including the bascule span, were replaced with a higher profile and wider channel to accommodate navigational traffic.

As a result of the continued deterioration of the bridges, in 2004 the FDOT authorized Miami-Dade County to post load restrictions on the bridges. Between 2009 and 2011, the County conducted another major rehabilitation project to repair the causeway's bridges. The scope of work for this rehabilitation included major repairs to the bridge support beams, diaphragms, deck undersides, and support piers. In 2011, FDOT in partnership with Miami-Dade County initiated the PD&E Study. Between 2015 and 2016 the Venetian Causeway underwent an Emergency Repair to replace the remaining original spans of Bridge 1 (spans 1 to 16). The bridges are continuously being repaired in order to keep them operational.

The deteriorated condition of the bridges, deck geometry, and load carrying capacity of the bridges, affects the ability of the bridges to adequately serve traffic demand; as such, Bridges 2 thru 12 have been classified as functionally obsolete. Bridge 1 has been replaced in phases and is not considered to be functionally obsolete.

Due to the accelerated state of deterioration, inspection dates were increased from biennial inspections (every other year) required by Federal Highway Administration (FHWA) to biannual inspections (every 6 months).

1.2 Project Description

The Venetian Causeway is approximately 2.5 miles long and is primarily a two-lane undivided facility that provides a major link between the City of Miami and the City of Miami Beach in Miami-Dade County, Florida. The Venetian Causeway includes ten fixed span bridges and two bascule leaf span bridges over the Intracoastal Waterway (bridge numbers 874459, 874460, 874461, 874463, 874465, 874466, 874471, 874472, 874473, 874474, 874477, and 874481) extending from North Bayshore Drive (City of Miami) to Purdy Avenue (City of Miami Beach).

The bridges were originally built in 1926 and have been designated as historic landmarks by the City of Miami and City of Miami Beach; they are also listed on the National Register of Historic Places (NRHP). The project will take this historic designation into consideration and ensure that any decisions on improvements are coordinated through the County and a Task Force of representatives that reflect the local, state and federal interests of historic preservation. Given the historicity of the bridge, rehabilitation options will also be explored as part of the potential alternatives during the PD&E Study.

The causeway bridges are mainly short span reinforced concrete arch beam bridges. Each bridge section consists of two 12-foot travel lanes with 4-foot bike lanes and 4-foot sidewalks on each side. In 1996, the bridges underwent a major rehabilitation consisting of gunite repairs to the superstructure arch beams and full replacement of all sidewalks and railings. The western bascule bridge (Bridge 1) and its spans 17 through 41 were also replaced. Presently, the bridges exhibit severe deterioration because of their proximity to the very aggressive marine environment. Due to new design codes, these bridges do not meet current design and safety requirements.

The corridor is tolled and is owned and operated by Miami-Dade County. A Project Location Map is included as **Figure 1-1**.



Figure 1-1 Project Location Map

1.3 Purpose and Need

The purpose of the proposed project is to address identified structural and functional deficiencies of the twelve existing bridges (ten low-level fixed spans and two movable bascules) through potential alternatives such as replacement or rehabilitation. The improvements are anticipated to meet the following identified needs:

1.3.1 Structural and Functional Deficiencies

The Venetian Causeway is classified as an urban minor arterial in Miami-Dade County and is a significant transportation route connecting the City of Miami with the City of Miami Beach. The bridges along the Venetian Causeway were originally built in 1926 with an anticipated design life of 50 years. The bridges have exceeded their design life by over 30 years and, in some cases, have been classified as functionally obsolete. A bridge is considered functionally obsolete if it has deck geometry, load carrying capacity, clearance or approach roadway alignment that no longer meet criteria for the system which the bridge is a part. Functionally obsolete bridges do not have adequate lane widths, shoulder widths or vertical clearances to serve the traffic demand or may occasionally flood. Due to the accelerated state of deterioration, inspection dates were increased from the biennial minimum required by FHWA to biannual

inspections. Bridge Inspection Reports (conducted between October 2018 and January 2019) yielded sufficiency ratings between 16 and 67.6 on a scale of 100.0 for the various bridges. According to the FHWA policy, bridges with a sufficiency rating of less than 50 are eligible for replacement. The sufficiency rating of each bridge is shown in **Table 1-1**.

The superstructure of each of these bridges displays advanced corrosion with section loss of several members that is significant enough to warrant supplemental supports and/or load restrictions. The bridge inspection reports also cite:

- Under-deck cracks;
- Failure of compression joints;
- Delamination and cracks on pier walls and abutments;
- Corrosion and section loss of substructure members;
- Major deficiencies in the bridge tender's facility;
- Major deck pavement deterioration;
- Substandard signing;
- Pavement marking and signalization; and
- Major Americans with Disabilities Act (ADA) deficiencies on both sidewalks along the bridges.

Once initiated, corrosion cannot be remedied, and sufficiency ratings are only expected to decrease further over time.

Table 1-1 Venetian Causeway Bridge Inventory Ratings

Bridge No.	FDOT Bridge No.	2019 Sufficiency Rating	Deficiency
1	874459	67.6	
2	874460	36.6	Functionally Obsolete
3	874461	23.6	Functionally Obsolete
4	874463	25.1	Functionally Obsolete
5	874465	23.6	Functionally Obsolete
6	874466	28.1	Functionally Obsolete
7	874471	37.6	Functionally Obsolete
8	874472	25.1	Functionally Obsolete
9	874473	27.4	Functionally Obsolete
10	874474	32.2	Functionally Obsolete
11	874477	34.3	Functionally Obsolete
12	874481	16	Structurally Deficient

1.3.3 Modal Interrelationships

Sidewalks and bicycle lanes exist on both sides of the Venetian Causeway along the entire corridor. Both the City of Miami and the City of Miami Beach Bicycle Master Plans identify Venetian Causeway as a significant bicycle corridor as it serves as one of the County's most well-traveled recreational and commuter bicycle routes. Pedestrian facilities will additionally be studied for opportunities to enhance safety and connectivity. Pedestrian and bicycle mobility is anticipated to be improved as a result of this project.

It should be noted that a Miami-Dade Transit bus route also operates along the causeway corridor, Route 101, Route A. This route connects the Omni Metromover/Bus Terminal adjacent to the Performing Arts Center to Lincoln Road in South Beach. Bus operation will be maintained on the corridor.

1.3.4 Emergency Evacuation

The Venetian Causeway not only serves west/east travel between the City of Miami and the City of Miami Beach, but it also serves regional travel as it is one of only two routes leading from south Miami Beach that provides hurricane evacuation capabilities.

1.4 Alternatives Considered

Alternatives evaluated during the PD&E Study include the No-Action Alternative, the Transportation Systems Management, and Operations (TSM&O) alternative, and two build alternatives as described below. Alternatives were developed and evaluated based on the ability to meet the project needs. The No-Action Alternatives will remain viable until after the Public Hearing. For additional information relating to the Alternatives Analysis, please see the Preliminary Engineering Report (PER) on file at FDOT, District 6.

1.4.1 No-Action Alternative

The No-Action Alternative maintains the existing bridges and roadway approaches in their current condition. No improvements would be made on the structures, except for routine maintenance. This alternative is used as a basis to evaluate the other project alternatives.

As a result of the bridge inspections dated October 11, 2018 thru January 15, 2019, Bridges 2 thru 11 in the causeway were classified as "functionally obsolete" and Bridge 12 was classified as "structurally deficient". Sufficiency ratings for bridges 2-12 are all below 50 out of a possible 100 based on the FHWA Sufficiency Rating Evaluation. According to the FHWA policy, bridges with a sufficiency rating of less than 50 are eligible for replacement.

The No-Action Alternative includes only routine maintenance performed as needed to keep the bridges open to traffic until safety issues, such as reduced capacity due to ongoing deterioration, would require them to be closed. Repair or replacement could be considered at a later date. This alternative does not include modification or improvements to the existing bridges or approach roadway. Existing geometric features and other deficiencies, including substandard lane width and curbs would remain. No changes to the existing horizontal and vertical navigational clearances would occur. The routine maintenance that would be performed on the structures would include:

- Spall repairs;
- Structural steel cleaning and painting;
- Steel repairs; and
- Mechanical and Electrical maintenance repairs.

The bridges are vulnerable to coastal storms and are below the 100-year Peak Storm Surge elevation of 11.6 feet NAVD88. Storm surge heights range from 7.7 feet (FEMA) to 11.6 feet for the 100-year storm. Wave crest is storm surge plus 70% of the maximum wave height. The Causeway fixed bridges would be inundated in the 100-year storm event. The bridges are also scour susceptible. The 100-year base flood event is predicted to result in scour to an elevation of (-)20.9 feet, which is below average existing pile tip elevation of (-)19.0 feet. This would result in bridge failure.

The No-Action Alternative would preserve the historic character of the Venetian Causeway and does not appear to be an adverse effect to the significant resources under Section 106. There are also no impacts to noise and air quality and no potential for contamination involvement with the no-action alternative. However, the alternative was deemed to be neither feasible nor prudent as it does not correct the bridges' structural and functional deficiencies. In addition, the lack of appropriate treatment of stormwater runoff will continue to degrade the natural habitat of Biscayne Bay. Over time, continued deterioration of structural elements will pose safety hazards to the public or place intolerable restrictions on travel.

1.4.2 Transportation Systems Management & Operations (TSM&O)

The objective of Transportation Systems Management & Operations (TSM&O) multi-modal improvements is to identify strategies that reduce existing traffic congestion and prevent its occurrence in areas that are currently not congested. These strategies are designed to modify travel behavior and increase system efficiency without costly infrastructure improvements. TSM&O strategies are implemented when one or more of the following occurs:

- Insufficient funds available to meet system improvement needs;
- Increased construction costs for new roadways and transit facilities;
- Increased need to improve operational efficiency; or
- Changes in travel patterns.

TSM&O options generally include traffic signal and intersection improvements, access management and transit improvements. The TSM&O Alternative includes those types of activities designed to maximize the utilization and efficiency of the present system. The alternative components that were considered include the following:

- Traffic signal optimization;
- Traffic operational improvements to include signing and pavement marking improvements;
- Enhanced bus service;
- Facilitated pedestrian and bicyclist measures; and
- Limited repairs on the existing bridges to improve operation.

Similar to the No-Action Alternative, the TSM&O Alternative would preserve the historic character of the bridges and does not appear to be an adverse effect to the significant resources under Section 106, but maintains the existing bridges in their current condition. There are no impacts to noise and air quality and no potential for contamination involvement. The alternative provides some transportation operation improvements on the corridor, but was deemed to be neither feasible nor prudent as it does not correct the bridges' structural and functional deficiencies. In addition, the lack of appropriate treatment of stormwater runoff will continue to degrade the natural habitat of Biscayne Bay. Over time, continued deterioration of structural elements will pose safety hazards to the public or place restrictions on travel.

1.4.3 Build Alternative - Rehabilitation

Stormwater Management System

Existing stormwater management systems in the residential islands and proposed systems on the spoil islands will be utilized to collect runoff from the bridges since scuppers will be eliminated with the replacement of the existing bridge deck. These systems will provide water quality and attenuation. The stormwater management approach will be coordinated through pre-application meetings with DERM, the local-environmental agency, and SFWMD, the regional water management district as well as the maintaining agencies, such as the City of Miami and the City of Miami Beach.

For Bridge 12, half of the stormwater runoff will drain toward the City of Miami Beach's stormwater management system along Dade Boulevard and Sunset Harbour Drive. Dade Boulevard has completed reconstruction and the proposed stormwater management approach will be coordinated with the City of Miami Beach to ensure there is sufficient capacity to handle the stormwater runoff.

Rehabilitation Alternative 4: Fixed Bridge Rehabilitation with Beam Strengthening

Rehabilitation Alternative 4 would correct physical and design criteria deficiencies of the existing bridges to extend their service life. Considering the historical significance of the existing causeway, all efforts were made to protect and preserve the bridges as a historic resource. This rehabilitation alternative includes deck replacement, beam strengthening and foundation strengthening. This alternative was developed in order to maintain the existing bridges in their location without major changes, and to extend service life by 25 years.

This alternative achieves the established rehabilitation criteria and includes the following:

- Replace the existing 6.5-inch deck with a new higher strength concrete 8.5-inch deck;
- Strengthen the existing foundations by installing new drilled shafts (Figures 1-2 and 1-3);
- Foundations designed to resist wave force vulnerability;
- Encase existing and new footings to strengthen the foundations;
- Repair concrete spalls and cracks in the beams and diaphragms;
- Repair jacketed piles;
- Strengthen interior beams by widening by 8-inches on both sides and strengthening exterior beams by widening by 8-inches on the inside face.

- Strengthened beams, cast-in-place deck and strengthened foundation would provide adequate resistance to meet current FDOT/American Association of State Highway Transportation Officials (AASHTO) live load requirements.
- Strengthened foundation to meet the standards for scour resistance, wave force resistance (classified as Extremely Critical) and vessel impact resistance (classified as Critical). Refer to the Bridge Hydraulics/ Design Scour Report dated May 27, 2016.
- Cathodic protection impressed current system for the beams and diaphragms. Refer to Conceptual Cathodic Protection Design for Bridge Superstructure and Substructure Components dated June 15, 2015.
- Bridges would be closed one at a time during construction, and detours would be provided.
- Utility services would be maintained on the bridge during its construction time.

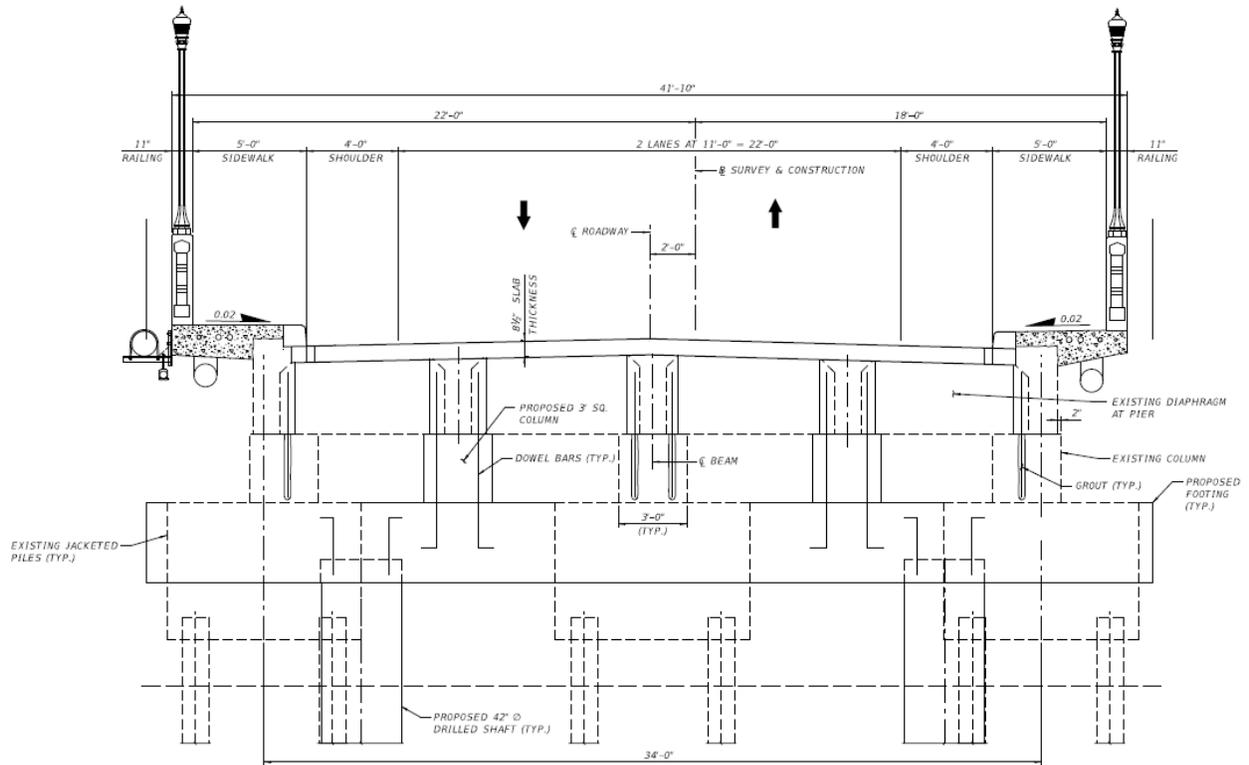


Figure 1-2 Rehabilitation Alternative 4: Beam and Foundation Strengthening Concept

periodic repairs. This rehabilitation alternative would not include changes in the horizontal or vertical clearance. The bridge would not be widened; therefore, the existing sidewalks and lane configurations would remain the same.

The following scope of work is recommended for the Rehabilitation Alternatives:

Bridge 1 (West Bascule – 874459)

The easternmost spans of this bridge were partially replaced in 1999 and then the westernmost spans were replaced in 2016 in the Emergency Repair Project. As such, the bridge is in good condition. The following repairs should only be considered as part of any future rehabilitation to extend the life of the bridge. These costs were not included in the cost estimates for the project.

Structural:

- Recondition Bascule Span Superstructure (Reduce Maintenance):
 - Replace Steel Coating System
 - Use Metalized Primer for Enhanced Corrosion Resistance
 - Replace Bolts
 - Use Mechanically Galvanized Structural Bolts for Enhanced Corrosion Resistance
 - Use Stainless Steel (Type 316) Fasteners for Miscellaneous Components
- Modify Bascule Span Superstructure (Improve Functionality/Maintenance):
 - Replace Sidewalk Plates and Install New Curb Assembly (5-foot Wide Sidewalk)
 - Install Machinery Room Access Platforms
 - Modify Bridge Railing to Accept Railing Mounted Span Locks
- Repair Bascule Pier Concrete (Extend Concrete Service Life):
 - Clean and Seal Cracks
 - Replace Class 5 Applied Finish Coating
- Recondition Fender System (Reduce Maintenance):
 - Replace Timber Components with Plastic Marine Lumber
 - Replace Hardware with Stainless Steel (Type 316) Hardware
 - Replace Access Ladders and Cages

Mechanical:

- Recondition Hydraulic Cylinder Drive System (Improve Reliability/Reduce Maintenance):
 - Recondition Hydraulic Cylinders
 - New Seals, Rod Bearings
 - Clean and Polish Rods
 - Replace Lubrication Fittings
 - Flush and Clean Clevis Assemblies
 - Replace Flexible Hosing and Fittings
 - Recondition Hydraulic Power Units
 - Replace Motors and Pumps
 - Replace Seals
 - Replace Valves
 - Replace Electronic Controls
 - Replace Flexible Hosing and Fittings
 - Replace Fluid, Clean and Flush System

- Recondition Trunnion Assemblies
 - Clean and Polish Journal Surfaces
 - Replace Lubrication Ports, Flush and Clean bearings
- Properly Balance Spans
- Adjust Live Load Shoes
 - Replace Shims and Hardware
- Replace Span Lock Assemblies
 - Mount in Modified Bridge Railings with Access from Sidewalks

Electrical:

- Replace Electrical Power Distribution System (Improve Reliability/Reduce Maintenance):
 - New Conduit, Wiring, Junction Boxes, Receptacles, Pier Lighting
 - Use Improved Materials for Enhanced Corrosion Resistance
 - Recondition Motor Control Center
 - New Service Entrance
 - Recondition Standby Generator and Automatic Transfer Switch
 - New Grounding and Surge Suppression System
 - New Submarine Cable Installed in Permanent Duct
- Replace Electrical Control System (Improve Reliability/Reduce Maintenance):
 - Recondition Control Desk, Control Panels, Relays/PLC
 - New Limit Switches
- Replace Navigation Lighting (Improve Reliability/Reduce Maintenance)
- Replace Warning Gates and Signals (Improve Reliability/Reduce Maintenance)

Architectural:

- Renovate Control House
 - Replace Windows and Doors
 - Install Closed Circuit Television (CCTV) Camera System
 - Clean and Paint Interior
 - Replace Flooring

Bridge 10 (East Bascule – 874474)

This bridge was completely rehabilitated in 1999 to include new electrical and mechanical systems as well as new bascule leaves. In 2016, there was also a structural, mechanical, and electrical rehabilitation to improve existing conditions. This rehabilitation would extend the life of the bridge by 25 years.

Structural:

- Recondition Bascule Span Superstructure (Reduce Maintenance):
 - Replace Bolts. Use Mechanically Galvanized Structural Bolts for Enhanced Corrosion Resistance
 - Use Stainless Steel (Type 316) Fasteners for Miscellaneous Components
- Modify Bascule Span Superstructure (Improve Functionality/Maintenance):
 - Replace Sidewalk Plates and Install New Curb Assembly (5-foot Wide Sidewalk)
 - Install Machinery Room Access Platforms
- Repair Bascule Pier Concrete (Extend Concrete Service Life):
 - Remove Surface Concrete to Depth of Reinforcing

- Removes Unsound and Contaminated Material
 - Supplement Deteriorated Reinforcing Steel (as Required)
 - Install Cathodic Protection System
 - Use Corrosion Resistant concrete
 - Replace Class 5 Applied Finish Coating
- Strengthen Bascule Pier Foundations (Resist Wave Loading):
 - Remove Bascule Pier Deck and Deck Joints between Curbs
 - Remove Live Load Support Beams and Concrete Brackets
 - Temporarily Remove Bascule Leaves
 - Float-out on Barges
 - Install Drilled Shafts or Driven Concrete Piles between Footings
 - Install Steel Sheet Pile Cofferdam with Tremie Concrete Seal and Dewater
 - Facilitates Construction in the Dry
 - Install Reinforcing Steel and Anchor to Pier Footings
 - Form and Pour Concrete Strut between Pier Footings
 - Cut-off or Remove Steel Sheet Piles
- Construct Counterweight Enclosure (Prevent Submersion of Counterweight/Improve Protection)
 - Construct Precast Enclosure Slab/Walls
 - Install Precast between Pier Columns and Seal with Supplemental Forms
 - Install Tremie Concrete Seal and Dewater
 - Facilitates Construction in the Dry
 - Install Reinforcing Steel and Anchor to Pier Columns, Beams and Diaphragms
 - Form and Pour Concrete Slab and Walls
 - Reinstall Bascule Leaves
 - Float-in on Barges
 - Reconstruct Live Load Shoe Support Beams and Concrete Bracket
- Reconstruct Bascule Pier Deck between Curbs
- Install Galvanized Steel Screen and Gate along Front Wall (Prevent Unauthorized Access)
- Recondition Fender System (Reduce Maintenance):
 - Replace Timber Components with Plastic Marine Lumber
 - Replace Hardware with Stainless Steel (Type 316) Hardware
 - Replace Access Ladders

Mechanical:

- Recondition Drive Train (Improve Reliability/Reduce Maintenance):
 - Replace Steel Coating System
 - Use Metalized Primer for Enhanced Corrosion Resistance
 - Recondition Gear Boxes
 - Replace Gaskets, Breathers, and Sight Glasses
 - Recondition Bearings
 - Clean and Polish Surfaces
 - Replace Lubrication Ports, Flush and Clean

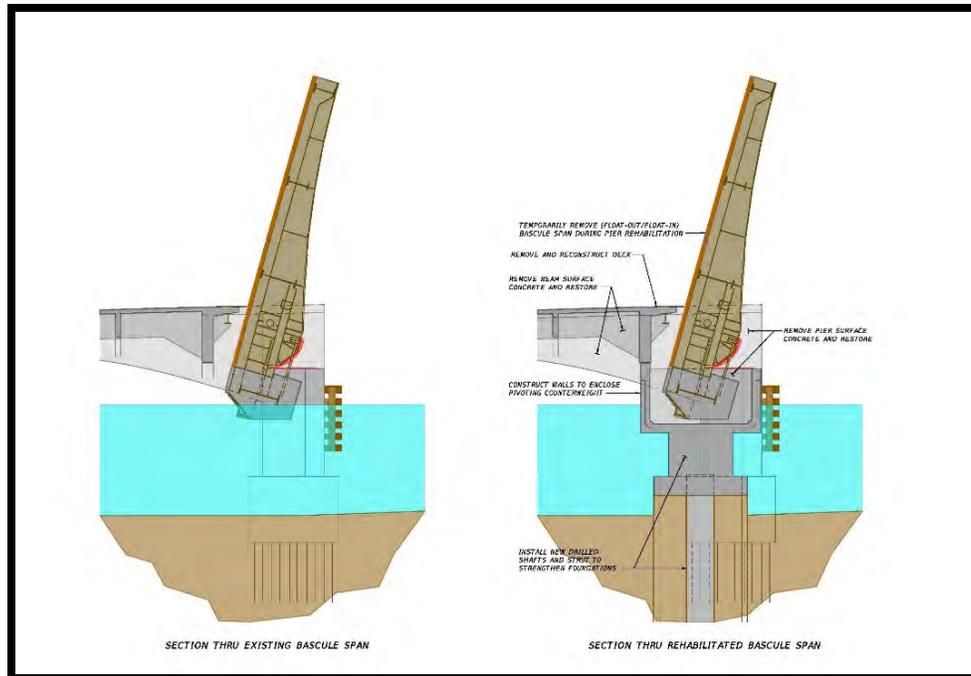


Figure 1-4 Bridge 10 Bascule Leaf Rehabilitation Concept

Electrical:

- Replace Electrical Power Distribution System (Improve Reliability and Reduce Maintenance):
 - New Conduit, Wiring, Junction Boxes, Receptacles, Pier Lighting
 - Use Improved Materials for Enhanced Corrosion Resistance
 - New Motor Control Center
 - New Service Entrance
 - New Standby Generator and Automatic Transfer Switch
 - New Grounding and Surge Suppression System
 - New Submarine Cable Installed in Permanent Duct
- Replace Navigation Lighting (Improve Reliability/Reduce Maintenance)
- Replace Warning Gates and Signals (Improve Reliability/Reduce Maintenance)

Architectural:

- Renovate Control House
 - Replace Windows and Doors
 - Install CCTV Camera System
 - Clean and Paint Interior
 - Replace Flooring

Anticipated Cost: \$9 Million

1.4.4 Build Alternative - Replacement

Stormwater Management System

Similar to the rehabilitation approach, the existing stormwater management systems in the residential islands and proposed systems on the spoil islands will be utilized to collect runoff from the bridges since scuppers will be eliminated. These systems will provide water quality and attenuation. The stormwater management approach will be coordinated through pre-application meetings with DERM, the local environmental agency, and SFWMD, the regional water management district as well as the maintaining agencies, such as the City of Miami and the City of Miami Beach.

For Bridge 12, half of the stormwater runoff will drain toward the City of Miami Beach's stormwater management system along Dade Boulevard and Sunset Harbour Drive. Dade Boulevard has completed reconstruction and the proposed stormwater management approach will be coordinated with the City of Miami Beach to ensure there is sufficient capacity to handle the stormwater runoff.

Replacement Alternative T1: Venetian Railing

Bridge railings are required for the protection of traffic and pedestrians from drop offs and other obstacles and must function to contain and redirect errant vehicles using the structure. Bridge railings are designed to satisfy requirements provided by AASHTO's Guide Specification for Bridge Railings. AASHTO requires railings to have performance characteristics based on a number of factors such as: roadway classification, design speed, average daily traffic, percentage of truck traffic, alignments and bridge conditions.

The T1 alternative maintains the existing Venetian Railing at the coping, and maintains the historical character of the causeway (Figure 1-5). The existing Venetian Railing is different from the original Venetian Railing. During the 1996 to 1999 Rehabilitation Project, the original railings were replaced with heavier railings designed for vehicular impact consistent with the AASHTO requirements at the time, but not the geometric requirements. The provision of a curbed sidewalk in front of the railing was introduced on both sides of the bridge to mitigate for any geometric deficiencies. The existing Venetian Railing was also used in the 2016 Emergency Repair Project for Bridge 1. The existing Venetian Railing maintains the historic appearance of the causeway. The railing will not comply with all the geometric requirements of AASHTO's Guide Specification for Bridge Railings, so a variation or exception will be required.

T1 – Venetian Railing



Figure 1-5 Replacement Alternative T1: Typical Section

Replacement Alternative 7: Arched Beams

The Arched Beam superstructure replacement alternative supports the required AASHTO HL-93 load. The HL-93 truck consists of a “design truck plus design lane load” or “design tandem plus design lane load”, whichever is the worst case. The design truck is a 3-axle HS20 truck with weight limit of 36 tons, the design tandem is a military truck with twin axles of 12.5 tons each, and the design lane load consist of a 9.3KN/m uniformly distributed in the longitudinal direction. The structural system mimics the dimensions and appearance of the original structure. The superstructure consists of variable depth arched beams. The variable depth beams are approximately 2 feet deep at midspan and 4 feet deep at beam ends (See Figure 1-6).



Figure 1-6 Replacement Alternative 7: Arched Beam Elevation View

The proposed approach span bridge section would be increased 16 feet from the existing 41-foot 10-inch wide section. The 57-foot 10-inch-wide bridge section includes two 8-foot sidewalks, two 1-foot 6-inch shoulders, two 7-foot. buffered bicycle lanes and two 11-foot travel lanes (See Figure 1-7).

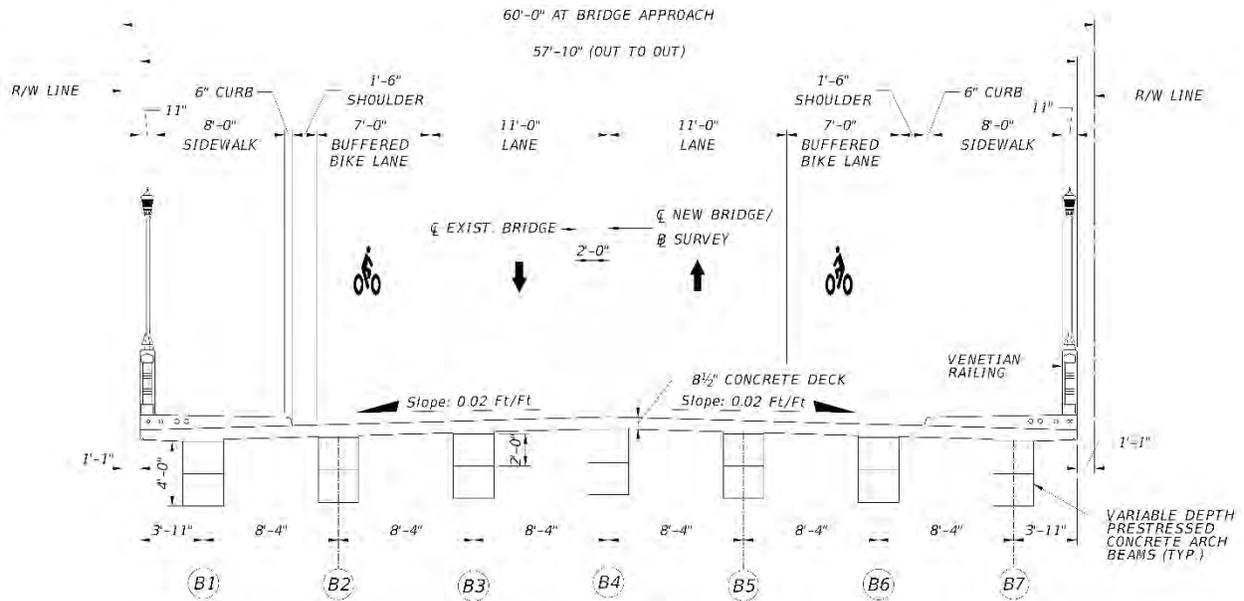


Figure 1-7 Replacement Alternative 7: Arched Beam Typical Section

Bridge height affects the extent of potential impacts to right-of-way and connecting streets. The vertical alignment of the new fixed bridges would be raised a minimum of 1 foot above the existing clearance to Biscayne Bay. The raised bridge profile will require modifications to the roadway approaches. (See Figure 1-8)

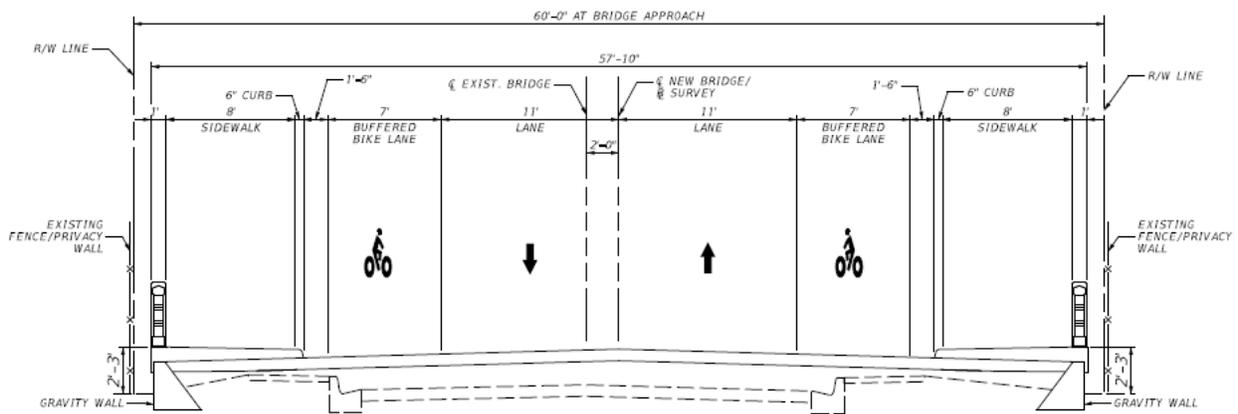


Figure 1-8 Replacement Alternative 7: Raised Bridge Profile

Substructure

Two foundation types were considered for the replacement alternatives:

- 24-inch Square Prestressed Concrete Piles
- 48-inch Drilled Shafts

Deep foundations with piles consist of a footing or pile cap supported by precast, prestressed concrete square piles. Piles are slender members that support the foundation loads when the soil is not capable of doing so. The piles resist and transfer the vertical and horizontal bridge loads to the soil or rock.

Advantages of piles include:

- Elimination of need for cofferdams and dewatering if pile caps are used;
- Fewer environmental impacts would be incurred; and
- Piles are less prone to scour and erosion.

Disadvantages of piles include:

- Driving piles may incur impacts to adjacent bridges and homes in close proximity;
- Piles are more susceptible to marine collision damage especially if they are exposed when pile caps are used; and
- Piles would require more specialized testing and inspection.

Deep foundations with drilled shafts are cast-in-place reinforced concrete piles. They are larger than driven piles, therefore they can take larger loads than piles as well as resist more vertical loads and moments. Drilled shafts are constructed by drilling to the required depth, cleaned, inspected, reinforced with a reinforcing steel cage, and concrete placed in the hole. The construction process is not environmentally friendly due to the drilling operation; however, noise impact would be greatly reduced for this alternative.

Despite the high cost of drilled shafts, they are recommended for this project to reduce noise impacts. Additionally, drilled shafts were proven to be effective during the partial Bridge 1 replacement in 1999 and 2016.

Estimated ROW Acquisition: None

Anticipated Cost: \$47 Million

Replacement Alternative M4: Double Leaf Bascule Bridge

This alternative would replace the existing Bridge 10 movable bridge with a new double leaf bascule bridge 10. Advantages to the double leaf bascule bridges include:

- Unlimited vertical clearance in the raised position;
- The design can be laid out in a symmetrical arrangement which is an advantage when an “arched” look is desired; and
- They provide natural barriers to vehicular traffic when in the open position.

The existing bascule span provides 6 feet of minimum vertical clearance above mean high water at the face of fenders and 10 feet at the center of the navigation channel with the span lowered. The existing

horizontal clearance is 56 feet between fenders. There are no established official US Coast Guard (USCG) vertical or horizontal guide clearances for this waterway crossing. However, a USCG Bridge Permit will be required for the replacement bridge and the USCG will make a determination concerning acceptable vertical and horizontal clearances for the proposed replacement bridge. For reference, the bridges at the east end of Julia Tuttle Causeway (I-195) to the north and MacArthur Causeway (SR A1A) to the south are high-level bridges with fixed spans over the navigation channel that provide 35 feet of minimum vertical clearance above mean high water. They both provide 75 feet of horizontal clearance between fenders.

A 75-foot horizontal clearance between fenders is proposed for the movable span replacement option. This provides improved safety at the Venetian Causeway site and is consistent with bridges located to the north and south of the causeway. In order to span the proposed 75-foot wide navigation channel, the bascule span will require a minimum overall structure depth (controlled by the depth of the main girders) of approximately 10 feet at the face of the fenders (See Figure 1-9).



Figure 1-9 Replacement Alternative M4: Double Leaf Bascule Bridge

For a movable span bridge, the vertical clearance in the closed position affects the number of bridge openings and traffic flow. Higher vertical clearance in the closed position would require fewer bridge openings. The existing bridge provides only 6 feet of minimum vertical clearance at mean high water over the Intracoastal Waterway (ICWW) at the fenders in the closed position. Unlimited clearance is provided in the open position. The vessel height survey conducted on this bridge indicated the bridge would see less openings if the vertical clearance of the bridge was raised. The raising of the bridge must take into consideration the impacts to the spoil islands and residential islands as well as the historic appearance of the causeway. The bridge vertical clearance alternatives considered for Bridge 10 include:

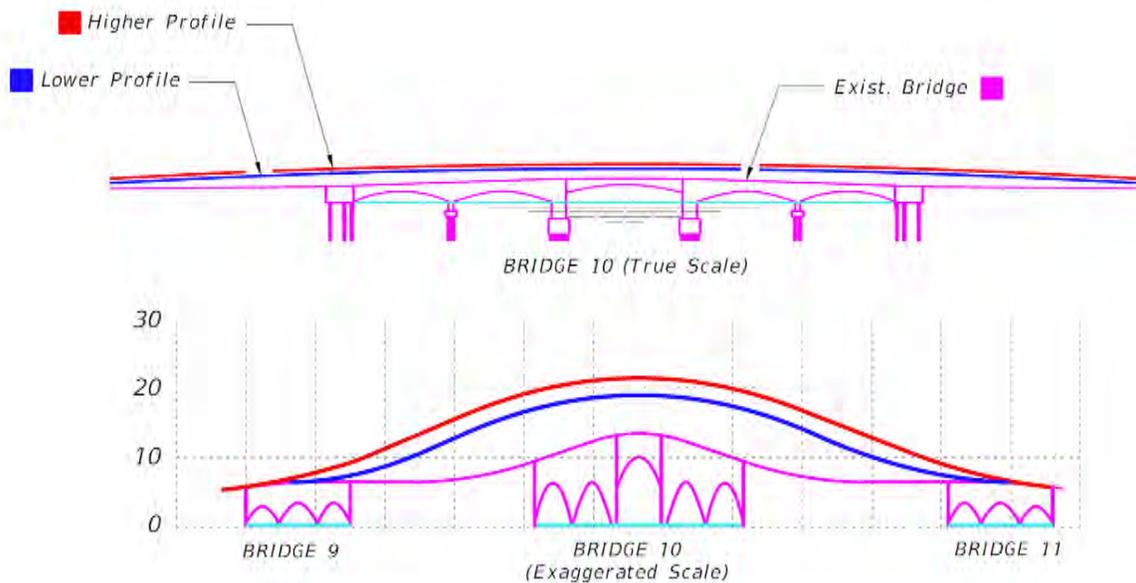
- 10.5 feet of vertical clearance at the fender and 13.5 feet of vertical clearance at centerline of channel. This profile maintains the drive machinery above the 100-year flood elevation. Although

the bascule piers will flood during a storm event, the mechanical and electrical systems of the bridge will remain above the flood elevation. The spoil islands will have retaining walls. A ramp could be provided for pedestrian access to the islands.

- 13.0 feet of vertical clearance at the fender and 16.0 feet of vertical clearance at centerline of channel. This profile would maximize the height of the bridge by raising the profile beginning at the point where bridges 9 and 11 connect to the residential islands. The spoil islands will have retaining walls. A ramp could be provided for pedestrian access to the islands.

The lower profile bridge with 10.5 feet of vertical clearance at the fender and 13.5 feet of vertical clearance at the centerline of the channel was requested by the public at the Alternatives Public Workshop, in order for the bridge to remain as low as possible and preserve its existing appearance.

Vertical profiles were prepared for the above alternatives to determine where each alternative would tie back into existing grade on the approach roadways. Both proposed profiles have a maximum vertical grade of five percent to meet ADA requirements for pedestrians (Figure 1-10).



NAVIGATION CLEARANCE POINT	VERT. CLEAR. (ABOVE MEAN HIGH WATER)		
	EXISTING	HIGHER	LOWER
at Fender	6.0'	13.0'	10.5'
at Center	10.0'	16.0'	13.5'
DECK ELEVATION AT PEAK	13.45'	21.45'	18.96'

BRIDGE 10 - VERTICAL PROFILE ALTERNATIVES

Figure 1-10 Bridge 10 Vertical Profile

A bridge profile with 10.5 feet of vertical clearance at the fender and 13.5 feet of vertical clearance at centerline of channel is proposed. This profile has the following benefits:

- Least impacts to the appearance of the causeway
- Reduces the need to raise bridges 9 and 11
- Minimizes the use of retaining walls
- Maintains pedestrian access to the spoil islands from the roadway
- Has the least impacts to the aesthetics and view shed of the causeway

Anticipated Cost: \$43 Million

1.5 Preferred Alternative

(To be completed after the public hearing.)

2.0 LAND USE

2.1 Existing Land Use

The existing land uses within the project area were determined through the interpretation and review of the 2008 South Florida Water Management District (SFWMD) Florida Land Use and Cover (FLUCCS) Geographical Information Systems (GIS) layer, and the more detailed Miami-Dade County LUMA land use GIS layer. Land uses identified within the proposed right of way (ROW) limits and adjacent to the corridor are summarized in **Table 2-1** and shown in **Appendix A**. A description of these uses based on the Florida Department of Transportation Florida Land Use, Cover and Forms Classification System (FLUCFCS) Handbook (January 2009), is provided below. The acreage of each land use type observed within the proposed ROW and within a 500-foot buffer from the ROW limits is shown in **Table 2-1** as interpreted from the Miami-Dade County GIS layer.

Table 2-1 Existing Land Uses Observed Within and Adjacent to the Venetian Causeway				
Land Use	Map ID	FLUCFCS Code	SFWMD GIS Map FLUCCS Code	Acreage Within 500' of ROW (County data)
Single Family Residential, Low and Medium Density (2-5 dwellings per acre)	10 /13	1200/1210	1210	117.56
Residential, High Density (Six or more dwellings per acre)	11	1300	1300	2.89
Multi-family, Low density / Multi-family, High density / Multi-floor Residential with Commercial use / Transient Residential	30 / 35 / 180 /200	1343 / 1340	1340	38.60
Commercial and Services / Office Building	110 / 113	1400/1430	1400	4.31
Industrial	320	1500	1500	0.17
Private Schools / Colleges and Universities	412 / 414	1710	1700	2.07
Religious	440	1720	1700	1.37
Hospitals and Nursing Homes and Adult Congregate Living Quarters	430	1740	1700	0.51

Table 2-1 Existing Land Uses Observed Within and Adjacent to the Venetian Causeway				
Land Use	Map ID	FLUCFCS Code	SFWMD GIS Map FLUCCS Code	Acreage Within 500' of ROW (County data)
Governmental (including Administration and vacant government property) / Road Maintenance and Storage Yards, and Motor Pools	450	1750	1700	7.98
Marinas	527	1800/1840	Various	8.22
Recreational (Municipal Operated Parks and Private Recreational Facilities)	510 / 517	1860	Various	18.68
Open Land, privately owned	804	1900/1920	1300	11.21
Streets and Roads / Paved Highways, Expressways, and Ramps / Street Right-of-Way and Entrance Features	640	8000/8140	Various	63.27
Public and Private Parking	650	8180	1400	0.20
Communications	633	8200	1400	0.22
Channelized Waterways / Coastal Water with Biscayne Bay Aquatic Preserve / Embayments Opening	932	5103 / 5410	5410	332.66

The majority of land within and adjacent to the existing ROW is urban and built-up. The land use within the ROW is primarily transportation and exists as either road or highway, including ramps and entrance features. Within 500 feet of the existing ROW the land uses are predominantly medium density single family and high-density multi-family residential and commercial lodging exists adjacent to the east and west sides of the project corridor. Recreational land (public parks) and open space can be observed from the ROW. Each land use type is briefly discussed in the following sections.

2.2 Uplands

Urban and Built-up – FLUCFCS 1000 - Urban and built-up land consists of areas of intensive use with much of the land occupied by man-made structures. Included in this category are cities, towns, villages, strip developments along highways such areas as those occupied by malls, shopping centers, industrial and commercial complexes and institutions that may, in some instances, be isolated from urban areas.

Residential, Medium Density, Two to Five Dwelling Units Per Acre – FLUCFCS 1200/1210 – Residential land uses in this category include fixed single-family homes that are typically found in subdivisions or communities where there are from two to five residential units per acre. Some residential units may be apartments or duplexes as well.

Residential, High Density (Six or more dwellings per acre) – FLUCFCS 1300 – The residential land uses included in this category are primarily multi-family apartment buildings, condominium complexes or other high-density facilities other than individual single-family homes.

Multiple Dwelling Units, High Rise (Three Stories or more)- FLUCFCS 1340/1343 – The residential land uses included in this category are primarily multi-family apartment buildings, condominium complexes or other high-density facilities other than individual single-family homes. Most of these facilities are multi-story buildings with multiple units per building. These high-density urban housing developments are generally located in larger urban centers and may include recreational facilities as well as open or forested lands.

Commercial and Services – FLUCFCS 1400 - Commercial areas are predominantly associated with the distribution of products and services. This category is composed of many individual types of commercial land uses which often occur in complex mixtures. The Commercial and Services category includes all secondary structures associated with an enterprise in addition to the main building and integral areas assigned to support the base unit. Included are sheds, warehouses, office buildings, driveways, parking lots and landscaped areas. Other types of Commercial areas include shopping centers and commercial strip developments. These areas have distinctive patterns which are readily identifiable on aerial photographs. Frequently, individual houses and other classes of urban land use may be found within commercial areas. Such uses normally were not separately delineated unless they could be plotted into polygons of at least one acre in size.

Professional Services – FLUCFCS 1430 – Typical examples of this land use category include law offices, consulting firms, architectural firms, medical offices, and dental offices. This category is unique in that it often occurs in former residential areas whose structures have been renovated for these and other professional services uses. Increased parking facilities and other physical evidence, in addition to supporting non-photographic data, are used to identify this class.

Industrial – FLUCFCS 1500 - The Industrial category includes those land uses where manufacturing, assembly or processing of materials and products are accomplished. Industrial areas include a wide array of industry types ranging from light manufacturing and industrial parks to heavy manufacturing plants. Also included are those facilities for administration and research, assembly, storage and warehousing, shipping and associated parking lots and grounds. Typical examples of industrial types found in Florida are pulp and lumber mills, oil refineries with tank farms, chemical plants and brick making plants. Stockpiles of raw materials, large power sources and solid waste

product disposal areas are visible industrial features and are easily identified on conventional aerial photography.

Institutional – FLUCFCS 1700 - Educational, religious, health and military facilities are typical components of this category. Included within a particular institutional unit are all buildings, grounds and parking lots that compose the facility. Educational institutions encompass all levels of public and private schools, colleges, universities, training centers, etc. The entire areas enclosing buildings, campus open space, dormitories, recreational facilities and parking lots are included in this category when they are identifiable.

Educational Facilities – FLUCFCS 1710 – Educational institutions encompass all levels of public and private schools, colleges, universities, training centers, etc. This category includes all supporting facilities including parking lots, stadiums, and all buildings and other features that can be related to the educational facility.

Religious – FLUCFCS 1720 – All buildings that can be related to this category are included. Many religious facilities support schools and day care centers which reside within their property.

Medical and Health care – FLUCFCS 1740 – All buildings and grounds that compose Medical facilities are included.

Governmental – FLUCFCS 1750 – All buildings and facilities which are identifiable as non-military governmental are included in this class.

Recreational – FLUCFCS 1800 [Marinas and Fish Camps - FLUCFCS 1840; Community Recreational Facilities – FLUCFCS 1860] - Recreational areas are those areas whose physical structure indicates that active user-oriented recreation is or could be occurring within the given physical area. This category would include golf courses, parks, swimming beaches and shores, marinas, fairgrounds, etc. Open space or undeveloped land within these categories is usually included with this category (i.e. Rough areas on golf courses, etc.).

Open Land – FLUCFCS 1900 [Inactive Land with street patterns but without structures – FLUCFCS 1920] - This category includes undeveloped land within urban areas and inactive land with street patterns but without structures. Open Land normally does not exhibit any structures or any indication of intended use. Often, urban inactive land may be in a transitional state and ultimately will be developed into one of the typical urban land uses although at the time of the inventory, the intended use may be impossible to determine from aerial photo interpretation alone.

Transportation, Communication, and Utilities – FLUCFCS 8000

Roads and Highways – FLUCFCS 8140; and Auto Parking Facilities – FLUCFCS 8180 - Transportation facilities are used for the movement of people and goods; therefore, they are major influences on land and many land use boundaries are bordered by these facilities. Highways and major roads are easily identifiable on medium altitude photography. Highways include areas used for interchanges, limited access rights-of-way and service facilities. The Transportation category encompasses rail-oriented facilities including stations, round-houses, repair and switching yards and related areas.

Communications – FLUCFCS 8200 - Airwave communications, radar and television antennas with associated structures are typical major types of communication facilities that will be identified in this category.

2.3 Surface Waters

Bays and Estuaries – FLUCFCS 5410 [Embayments opening directly into the Atlantic Ocean] – Bays and estuaries are inlets or arms of the sea that extend into the land and, as such, are properly classified in this system only when they are included within the land mass of Florida. This group includes Biscayne Bay within the project area.

Channelized Waterways, Canals – FLUCFCS 5103 - This group includes Collins Canal, east of the project, which opens to Biscayne Bay.

3.0 AGENCY COORDINATION

In accordance with PD&E guidelines, the FDOT submitted the project into the Efficient Transportation Decision Making (ETDM) Environmental Screening Tool (EST) during the Programming Phase of the study. The ETDM Programming Summary Report (ETDM Number 12756), published on February 14, 2012, contains comments received from Environmental Technical Advisory Team (ETAT) members. The following is a discussion of agency coordination (including ETAT comments) regarding wetlands, wildlife and habitat, essential fish habitat (EFH) and agency involvement on this project.

ETAT Agency Comments:

National Oceanic and Atmospheric Administration (NOAA)

During the ETDM Planning Screen, NOAA's National Marine Fisheries Service (NMFS) conducted a field visit to assess the primary natural habitat at the site. Since the scope of the project has not changed for the Programming Screen, NMFS determined that the primary natural habitat at the site of the proposed project is sand and shell bottom, corals, macro alga, sponges and seagrass. As such, the NMFS anticipates construction-related direct and indirect impacts to EFH and Habitat Areas of Particular Concern (HAPCs). In particular, the NMFS noted a potential for direct impacts related to filling or mechanical removal of bridge materials colonized by hermatypic corals and sponges; and potential for indirect impacts from sedimentation and equipment operation during bridge demolition. The NMFS thus requires the relocation of corals, if feasible. The NMFS commented that the number, size, and species of corals and sponges should be documented in a benthic resources survey for use in determining corals feasible for relocation. The corals must be relocated, and consideration should also be given to relocating barrel sponges to minimize impacts and associated mitigation requirements. Any relocated resources should be monitored for a period of 5 years.

Additionally, NMFS advised that runoff from the new bridges should be treated prior to discharge, to the extent practicable. A Stormwater Management Plan will be required during construction for containment and treatment of surface and stormwater runoff from impervious surfaces, in accordance with National Pollutant Discharge Elimination Systems (NPDES) standards, and Best Management Practices (BMPs) for water quality and erosion control will be implemented.

As noted by NMFS, the shorelines within the project footprint are devoid of mangroves and impacts are not anticipated. Additionally, the NMFS identified the project area as designated critical habitat for Johnson's Seagrass (*Halophila johnsonii*), which is listed as "threatened" in the Endangered Species Act. Other species noted by NMFS include swimming sea turtles, staghorn (*Acropora cervicornis*) and elkhorn (*Acropora palmata*) corals, and smalltooth sawfish (*Pristis pectinata*).

Environmental Protection Agency (EPA)

The EPA commented that any potential impact on Biscayne Bay should be addressed in the selection of alternatives for rehabilitation and replacement methods.

United States Army Corps of Engineers (USACE)

The USACE commented on potential impacts to estuarine wetlands, seagrass, and mangrove resources, recommending alternatives that implement avoidance of all seagrass impacts by utilizing the same footprint as existing bridges, and employing phased construction techniques to avoid potential impacts associated with the use of temporary work platforms near seagrass.

Florida Department of Environmental Protection (FDEP)

The FDEP commented that the proposed Causeway stormwater system must meet the design and performance criteria established for the treatment and attenuation of discharges to Outstanding Florida Waters (OFW). The FDEP further noted that the project will require an Environmental Resource Permit (ERP) from South Florida Water Management District (SFWMD), specifying the elimination or reduction of the proposed wetland resource impacts to the greatest extent practicable.

SFWMD

The SFWMD commented that an ERP will be required for those bridges that do not qualify for a Noticed General Permit for Minor Bridge Alternation, Replacement, Maintenance, and Operation. The ERP must address surface water management, work in OSWs, impacts to OSWs, and a mitigation plan to offset any associated impacts. The plan should also include turbidity and erosion control measures in the plans, and work barge locations, if the barges are to remain in the water overnight, and how they will be anchored in proximity to resources. The SFWMD further advised that a benthic survey (conducted during seagrass growing season) should also be submitted with the ERP application, including an assessment of old pilings, mitigation measures, and measures to ensure protection of manatees during in-water work. The application must also demonstrate that the project will not cause indirect impacts to water resources or violate water quality standards.

United States Fish and Wildlife Service (USFWS)

The USFWS noted that wetlands should be avoided to the greatest extent practicable. The USFWS further noted that the Biscayne Bay serves as Critical Habitat for the endangered West Indian manatee (*Trichechus manatus*) and Johnson's seagrass. As such, *Standard Manatee Conditions for In-Water Work* must be followed during construction (see **Appendix C**). The project is also within the USFWS Consultation Areas for Atlantic Coast Plants, the American crocodile (*Crocodylus acutus*), the West Indian manatee, and the piping plover (*Charadrius melodus*). The USFWS requested that the existing bridges be removed without the use of explosives. If the use of explosives is necessary, further coordination with USFWS, Florida Fish and Wildlife Conservation Commission (FWC), and NMFS is required in the development of an

approved blasting plan, endangered species watch plan, and mitigation. Furthermore, explosive use must adhere to the FWC's *Draft Guidelines for the Protection of Manatees and Sea Turtles During the Use of Explosives in the Waters of the State of Florida* (see **Appendix C**).

Florida Fish and Wildlife Conservation Commission (FWC)

The FWC ETAT comments noted the project area is within the USFWS consultation areas for Atlantic Coast Plants, the American crocodile, the West Indian manatee, and the piping plover. In addition, the FWC provided a list of State-protected species found in **Section 4.0** of this report. The FWC recommended construction conditions be implemented to minimize potential for effects on the West Indian manatee and sea turtles and stated that any adverse impacts to seagrass or macrophytic algae beds must be mitigated. The FWC further stated that aquatic plant community mapping and wildlife surveys for the occurrence of Federal and State-listed species should be performed. Based on the results, a plan should be developed to address direct, indirect, and cumulative effects. The following construction measures were recommended by FWC for potential implementation on the project: Adherence to *Standard Manatee Conditions for In-Water Work*, blasting restrictions, turbidity barrier monitoring, manatee entrapment avoidance measures including the use of exclusionary grating on culverts, manatee observers during in-water work, and a defined or limited construction window including no nighttime work. If blasting cannot be avoided, a blast plan and marine species watch plan must be developed in coordination with, and approved by the FWC, USFWS, and NMFS, and incorporated as a permit condition. While not included in the scope of this project, the FWC requested that the project evaluate causeway fill island removal as potential exists to improve tidal circulation in Biscayne Bay with the removal of uninhabited fill islands. The FWC further commented that the scraped-down islands may be suitable seagrass restoration areas.

Agency Meetings:

An on-site field meeting was held on June 27, 2017 with Jennifer Shull of NMFS. Ms. Shull and representatives from the consultant team conducted a field review of the project site and the resources under NMFS jurisdiction. She was assigned as the NMFS ETAT representative after the project was screened through the ETDM process, therefore this meeting served as an introduction to the project.

An interagency meeting was held at the District Six office on June 28, 2017 with representatives from the FDOT, Miami-Dade County, City of Miami Beach, USCG, USACE, USFWS, NMFS, SFWMD and SHPO. During this meeting, the project team provided an overview of the project and discussed the alternatives being evaluated along with the schedule. Agency staff had an opportunity to ask questions and provide input on the alternatives.

4.0 PROTECTED SPECIES AND HABITAT

The following sections document the protected species and habitat within the project area.

4.1 Protected Species and Habitat Assessment Methodology

A detailed desktop analysis was performed to gather baseline information about potentially present species utilizing the following resources prior to field assessments: FDOT's EST; FDOT ETDM Programming Screen Summary Report Number 12756; USFWS listed species database for Miami-Dade County; Florida Natural Areas Inventory; FWC Bald Eagle Nest Locator; FWC bird rookery database; and the USFWS Wood Stork Core Foraging Area GIS [Florida Geographic Data Library (FGDL)] database.

Benthic surveys were conducted in August 2014 and July 2017 to characterize the benthic habitats and presence of Federal and State listed species in the marine environment (see **Section 6.2 Benthic Survey Methodology** and **Appendix D for Benthic Communities Assessment Report** for additional details). Terrestrial habitat assessments were also conducted in August 2014 and July 2017, as well as in November 2017, to characterize the wetland and terrestrial habitats above the mean low water line. These surveys consisted of a pedestrian survey of the spoil islands along the causeway and the project termini on the City of Miami mainland and the City of Miami Beach. Each bridge approach, developed island and undeveloped spoil islands were inspected for the presence of Federal and State listed plant and wildlife species and their habitats within the proposed project limits of each design alternative.

4.2 Protected Species Inventory

Tables 4-1 and 4-2 list the Federal and State listed plant and wildlife species with the potential for occurrence within the habitats present in the project corridor. This list has been compiled based on the above literature review and field surveys coupled with the availability of potential suitable habitat and confirmed sightings or documented home ranges. These species are listed by the USFWS, NOAA NMFS, or FWC as Federally endangered [FE], Federally threatened [FT], State threatened [ST], or State species of special concern [SSC]. The potential of occurrence for each species was assigned based on above mentioned data set and the field reviews. Low occurrence potential is assigned to species whose preferred habitat may be found along and/or adjacent to the project corridor, but species was not observed within the corridor or project area (1-mile radius) during field reviews. Moderate occurrence potential is assigned to species that have suitable habitat within the project corridor and have been documented within 1 mile of the project, but not observed within the project corridor during field reviews. High occurrence potential indicates that there is suitable habitat for the species within the project corridor, and the species was observed during field investigations.

Table 4-1 Federally Listed Species Potentially Associated with the Project		
Species Name	Listing Status	Occurrence Potential
Plants		
Johnson's seagrass (<i>Halophila johnsonii</i>)	FT	Low
Birds		
Wood stork (<i>Mycteria americana</i>)	FT	Low
Piping plover (<i>Charadrius melodus</i>)	FT	Low
Mammals		
West Indian manatee (<i>Trichechus manatus</i>)	FT	High
Reptiles		
American Crocodile (<i>Crocodylus acutus</i>)	FT	Low
Green sea turtle (<i>Chelonia mydas</i>)	FT	Low
Kemp's Ridley sea turtle (<i>Lepidochelys kempii</i>)	FE	Low
Leatherback sea turtle (<i>Dermochelys coriacea</i>)	FE	Low
Hawksbill sea turtle (<i>Eretmochyles imbricata</i>)	FE	Low
Loggerhead sea turtle (<i>Caretta caretta</i>)	FT	Low
Fish		
Smalltooth sawfish (<i>Pristis pectinata</i>)	FE	Low
Corals		
Elkhorn coral (<i>Acropora palmata</i>)	FT	Low
Staghorn coral (<i>Acropora cervicornis</i>)	FT	Low

The following subset of species falls under the jurisdiction of the NMFS or USFWS. Any involvement with these species or designated critical habitat would require consultation under Section 7 of the ESA. The NRE focuses on this subset of listed species:

National Marine Fisheries Service Jurisdiction

- Green turtle (*Chelonia mydas*): Atlantic populations of green turtles are typically found in estuarine, marine coastal and oceanic waters. This species nests on coastal Atlantic sand beaches between Volusia and Miami-Dade counties. Juveniles are frequently found in coastal bays, inlets, lagoons and offshore reefs. Large juveniles and adults feed on seagrasses and algae. It is unlikely this species would be present in the bay as forage habitat is sparse and nesting beaches are not present.
- Loggerhead turtle (*Caretta caretta*): The loggerhead turtle is found in marine coastal and oceanic waters. They nest on coastal sand beaches often near the dune line where it is sufficiently high enough to avoid inundation. Hatchlings often use offshore floating sargassum mats, and juveniles frequent coastal bays, inlets and lagoons. It is unlikely this species would be present in the bay as forage habitat is sparse and nesting beaches are not present.
- Leatherback sea turtle (*Dermochelys coriacea*): The largest sea turtle, leatherbacks are found in Florida's coastal waters, with a small number nesting on the Atlantic coast. They eat soft-bodied animals such as jellyfish. It is unlikely this primarily open ocean species would be present in the bay as the numbers of jellyfish and other forage species are minimal and there are no nesting beaches present.

- Kemp's Ridley sea turtle (*Lepidochelys kempi*): The Kemp's Ridley is the rarest sea turtle in the world. According to the FWC, its only major nesting beach is an area called Rancho Nuevo on Mexico's Gulf coast, but nesting females can be found on Florida and south Texas beaches. It is unlikely this species would be present in the bay as forage habitat is sparse and nesting beaches are not present.
- Hawksbill sea turtle (*Eretmochelys imbricata*): The hawksbill is the rarest sea turtle in Florida according to the FWC. Hawksbills inhabit reefs in the Florida Keys and along the southeastern Atlantic coast. It is unlikely this species would be present in the bay as potential forage habitat is sparse and nesting beaches are not present.
- Smalltooth sawfish (*Pristis pectinata*): The smalltooth sawfish is listed as an endangered species by the USFWS but is not listed by the FWC. The smalltooth sawfish is one of two species of sawfish that inhabit coastal US waters. Sawfish species are year-round residents of peninsular Florida, with most encounters occurring in southwest Florida from Charlotte Harbor to the Florida Keys. According to the FWC, smaller individuals from 3 to 6 feet (1 to 1.8 meters) total length typically live in estuarine systems close to shore near river mouths or tidal creeks, while larger smalltooth sawfish up to 18 feet (5.5 meters) typically inhabit deeper offshore waters. Juvenile smalltooth sawfish most often inhabit brackish water within a mile of land. They can be found in a wide range of habitats, including mud bottoms, sand bottoms, oyster bars, red mangrove shorelines, docks, seawall-lined canals and piers. The smalltooth sawfish is ovoviviparous meaning the mother carries the eggs inside her until they hatch, and the young are born alive, usually in litters of 15 to 20 pups. Juveniles will travel many miles up rivers if freshwater inflow is reduced. Large smalltooth sawfish, longer than 10 feet (3 meters), are occasionally found near shore in the spring when most sawfish are born, and mating is thought to occur, but most are reported in deeper offshore waters with muddy bottoms. The substrate around the entire project area consists of rocky rubble and clean concrete debris that has been deposited to stabilize the shoreline of the undeveloped spoil islands (no seawalls present). The same material has been used to face the seawalls at the bridge approaches and shorelines of the developed spoil islands within the project area. Since the smalltooth sawfish prefers sandy or muddy substrates, it is not likely to be present in the immediate project area where the bottom is mostly rocky and hardened.
- Johnson's seagrass (*Halophila johnsonii*): This seagrass species has delicate stems with small, narrow, spatulate leaves and imbeds in coastal sediments. It is typically found in tidal inlets, sandy shoals, and at mouths of canals. According to NMFS, Johnson's seagrass prefers to grow in coastal lagoons in the intertidal zone, in depths generally less than 10 feet. It is not as successful at intermediate water depths where other seagrasses thrive. The bottom sediments are typically coarse sand and muddy substrates and, in many instances, are found in areas of turbid waters and high tidal currents. Johnson's seagrass is more tolerant of wide ranges of salinity, extreme temperature exposure, and desiccation due to exposure on extremely low tides than the other seagrasses it is commonly found growing in association with. This project occurs within an area designated by NMFS as Critical Habitat for Johnson's seagrass (Biscayne Bay); however, Johnson's seagrass was not observed during the benthic surveys performed at the site. NMFS defines Critical habitat as areas that contain physical or biological features essential to conservation, that may require special management considerations or protection.

- Elkhorn coral (*Acropora palmata*): This species is a large, branching coral with thick antler-like branches. As stated on the USFWS website, colonies are fast growing with branches increasing in length by two to four inches (5-10 centimeters) per year. Colonies reach their maximum size in approximately 10-12 years. Elkhorn coral has been an important Caribbean coral contributing to reef growth and development and providing EFH for over 10,000 years. According to NMFS, Coral colonies prefer exposed reef crest and fore reef environments in depths of less than 20 feet (6 m), although isolated corals may occur to depths of 65 feet (20 m). Conditions within the shallow waters in and adjacent to the project corridor are suitable for this species to colonize and thrive, but none were observed during the benthic surveys performed at the site.
- Staghorn coral (*Acropora cervicornis*): Staghorn coral is a branching coral with cylindrical branches ranging from a few centimeters to over 6.5 feet (2 m) in length. This coral exhibits the fastest growth of all known western Atlantic corals, according to the USFWS, with branches increasing in length by four to eight inches (10-20 cm) per year. Like elkhorn coral, staghorn coral has been one of the most important Caribbean corals in terms of its contribution to reef growth and fish habitat. According to NMFS, staghorn coral occurs in back reef and fore reef environments from 0-100 feet (0 to 30 m) deep. The upper limit is defined by wave forces, and the lower limit is controlled by suspended sediments and light availability. Conditions within the shallow waters in and adjacent to the project corridor are suitable for this species to colonize and thrive, but none were observed during the benthic surveys performed at the site.

USFWS Jurisdiction:

- West Indian manatee (*Trichechus manatus*): Manatees are herbivorous marine mammals found in marine, estuarine, and freshwater environments. Manatees have large bodies with paired flippers and a round, paddle-shaped tail. They are typically grey in color and occasionally spotted with barnacles or colored by patches of green or red algae. The muzzle is heavily whiskered and coarse, single hairs are sparsely distributed throughout the body. The manatee typically inhabits coastal waters, bays and rivers. They require warm-water refugia during cold weather and can frequently be observed in large groups gathered in the effluent of cooling facilities at such times. The manatee is wide ranging during warmer months and restricted to springs and other warm-water areas during the winter. It can be found in any coastal or estuarine waters, but is most common in peninsular Florida. This project occurs within an area where manatees are frequently observed traveling to and from Warm Water Aggregation Areas, foraging and aggregation areas. This species is Federally protected under the Marine Mammal Protection Act.
- Wood stork (*Mycteria americana*): Wood storks are large, long-legged wading birds with overall white plumage except for black primary and secondary wing feathers and a short black tail. Wood storks generally feed on small freshwater fish and nest primarily in cypress swamps of the Everglades. According to the USFWS, small fish from 1 to 6 inches long provide this bird's primary diet. Wood storks capture their prey by a specialized technique known as grope-feeding or tacto-location, and often forage in water 6 to 10 inches deep or less, where a stork would be able to stand and probe with its bill partly open. Wood storks' core foraging area is defined by the USFWS as 18.6 miles from their nesting site for south Florida colonies. While the species has been known to use thermals to soar as far as 80 miles from nesting to feeding areas, this project is not located within the core foraging area of an active nesting colony according to the USFWS's map of Wood

Stork Nesting Colonies and Core Foraging Areas Active Within 2006-2015 in Florida (**Appendix F**). The absence of suitable forage habitat, trees that would provide potential perching or roosting habitat and concentrations of small aquatic prey species greatly reduce the potential of wood stork being present within the project corridor. Tidal flows and swiftly moving water during all tidal cycle changes would also prevent the wood stork from effectively foraging in the shallows adjacent to the bridges and spoil islands within the project site.

- Piping plover (*Charadrius melodus*): These small, stocky shorebirds have a sand-colored upper body, a white underside, and orange legs. During the breeding season, adults have a black forehead, a black breast band, and an orange bill. Piping plovers use wide, flat, open, sandy beaches with very little grass or other vegetation. Nesting territories often include small creeks or wetlands. The plovers eat insects, spiders, and crustaceans. There are no open sandy beach habitats present within or adjacent to the project corridor that this species could potentially utilize.
- American crocodile (*Crocodylus acutus*): The American crocodile is a large, greenish-gray crocodylian with black mottling. The American crocodile is found primarily in mangrove swamps and along low-energy mangrove-lined bays, creeks, and inland swamps. Crocodiles forage opportunistically, eating whatever animals they can catch. Juveniles typically eat fish, crabs, snakes, and other small invertebrates, whereas adults are known to eat fish, crabs, snakes, turtles, birds, and small mammals. There is no forage habitat and limited basking / nesting habitat on the undeveloped spoil islands within the project area due to the dense rip rap / concrete rubble that has been used to stabilize the shorelines. Other than individual animals traversing the project site during travel, it is unlikely this species is present within the project corridor.

Florida Fish and Wildlife Conservation Commission Jurisdiction

Table 4-2 State Listed Species Potentially Associated with the Project		
Species Name	Listing Status	Occurrence Potential
Birds		
Tricolored heron (<i>Egretta tricolor</i>)	ST	Low
Little blue heron (<i>Egretta caerulea</i>)	ST	Low
Roseate spoonbill (<i>Ajaia ajaja</i>)	ST	Low
Reddish egret (<i>Egretta rufescens</i>)	ST	Low
Black skimmer (<i>Rynchops niger</i>)	ST	Moderate
Least tern (<i>Sterna antillarum</i>)	ST	Moderate

- Tricolored heron (*Egretta tricolor*): The tricolored heron is a medium-size heron with a long slender neck, two-toned body coloration on the head, neck, and body along with a white underside. Nesting mostly occurs on mangrove islands or in freshwater willow thickets on islands or over standing water. This heron prefers coastal environments. Feeding areas consist of permanently and seasonally flooded wetlands, mangrove swamps, tidal creeks, ditches, and the edges of lakes and ponds.
- Little blue heron (*Egretta caerulea*): The little blue heron is a medium-size bird with a purple to maroon-brown head and neck, small white patch on the throat and upper neck and a slate-blue

body. It feeds in shallow freshwater, brackish, and saltwater habitats, and nests in woody vegetation such as: cypress, willow, maple, black mangrove, and cabbage palm.

- Roseate spoonbill (*Ajaia ajaja*): Adult spoonbills exhibit bright pink bodies, white necks, and flat, spoon-shaped bills. These birds nest on coastal mangrove islands or in Brazilian pepper on man-made dredge spoil islands near suitable foraging habitat. They will also nest in willow heads located in freshwater and forage in shallow water of varying salinity. Foraging habitats include marine tidal flats and ponds, coastal marshes, mangrove-dominant inlets and pools as well as freshwater marshes and sloughs.
- Reddish egret (*Egretta rufescens*): This egret has a gray body and chestnut-colored plumes on its head, neck, and upper body. Reddish egret habitat is almost exclusively in coastal areas, with nesting on coastal mangrove islands or in Brazilian pepper located on dredge spoil islands. Foraging habitats include shallow water areas (less than six inches deep) of variable salinity as well broad, open, marine tidal flats and shorelines supporting little vegetation.
- Black skimmer (*Rynchops niger*): The adult black skimmer is black above with white face and underparts. It has a bright red billed tipped with black and reddish legs. The bill of the adult black skimmer is long and flat and the lower mandible juts a third beyond the upper mandible. The immature black skimmer is brownish and speckled above with a smaller bill and duller legs than the adult. The black skimmer inhabits bays, marshes, beaches, and protected ocean waters.
- Least tern (*Sterna antillarum*): The least tern is a small pale bird with a dark-tipped yellow bill, legs, and feet, and white forehead. The adult has a long black wedge on its outer wings. The immature least terns have dark bills, dark cheeks and napes, dusky crowns, dark shoulder bars, and duller legs than adults. Least terns inhabit beaches, bays, and sandbars.

4.3 Critical Habitat

Critical Habitat is designated by the USFWS or NMFS, depending on their jurisdiction. For listed species, Critical Habitat consists of: (1) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of Section 4 of the ESA, on which are found those physical or biological features (constituent elements) (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of the ESA, upon a determination by the Secretary that such areas are essential for the conservation of the species. Designated critical habitats are described in 50 CFR 17 and 50 CFR 226.

The entire northern portion of Biscayne Bay (north of the Rickenbacker Causeway), has been designated Critical Habitat for Johnson's seagrass by the NMFS. As such, the project is located within federally-designated Critical Habitat for Johnson's seagrass. This species was not observed during the benthic resource surveys performed within the project corridor (see **Section 6.0** for additional information regarding EFH and **Appendix D** for a copy of the **Benthic Communities Assessment Report**). Therefore, impacts will be avoided to the greatest extent possible and a determination of "**may affect, not likely to adversely affect**" is anticipated for Johnson's seagrass Critical Habitat. During construction, BMPs will be implemented in accordance with the latest edition of *FDOT Standard Specifications for Road and Bridge Construction* to satisfy permit requirements and minimize potential downstream impacts from construction activities (i.e., turbidity).

The project lies within Biscayne Bay which is a Federally Designated Critical Habitat for Manatees. The bay is a known corridor through which manatees frequently travel to and from Warm Water Aggregation Areas that are located near Virginia Key and Fisher Island, both of which are south of the project corridor. The proposed construction will be phased to ensure manatees have unobstructed access to travel under the causeway(s) throughout construction. There are no known primary manatee feeding areas or aggregation areas in the vicinity of the Venetian Causeway. (See **Appendix D** for a copy of the benthic report). Based on this information, a determination of “**may affect, not likely to adversely affect**” is anticipated for West Indian manatee Critical Habitat.

4.4 Evaluation of Effect Determinations for Protected Species and Habitat

The following sections provide determinations regarding the effects that the project will have on listed species and critical habitats, pursuant to guidance within the FDOT PD&E Manual, and the USFWS and NMFS *Endangered Species Consultation Handbook*, 1998. A “no effect” determination is the appropriate conclusion when the action agency determines its proposed action will not affect a listed species or designated critical habitat. When a proposed action may pose any effects, detrimental or beneficial on listed species or designated critical habitat, a “may affect” determination is applied which includes both “may affect, not likely to adversely affect” and “may affect, likely to adversely affect” determinations. If any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated actions or interdependent actions, and the effect is not: discountable, insignificant, or beneficial, the determination is “may affect, likely to adversely affect.” However, as is the case with the subject project, effects on listed species are expected to be discountable, insignificant, or completely beneficial, which results in a “may affect, not likely to adversely affect” determination.

Federally Listed Species

The project is located within federally-designated Critical Habitat for Johnson’s seagrass. However, this species was not observed during the benthic resource surveys performed (See **Section 6.0** for additional information regarding EFH and **Appendix D** for a copy of the **Benthic Communities Assessment Report**). Therefore, no adverse impacts to this species are anticipated to occur because of this project and a determination of “**may affect, not likely to adversely affect**” is anticipated for Johnson’s seagrass and its habitat. During construction, BMPs will be implemented in accordance with the latest edition of *FDOT Standard Specifications for Road and Bridge Construction* to satisfy permit requirements and minimize potential downstream impacts from construction activities (i.e., turbidity).

The project lies within Federally Designated Critical Habitat for the West Indian manatee. However, the project occurs in an area of Biscayne Bay that is not manatee feeding habitat, as all observed seagrass occurs outside of the footprint of construction. Protection of West Indian manatees during all phases of bridge construction will be accomplished through the implementation of *Standard Manatee Conditions for In-Water Work*. If any of the free-swimming mammals are found within the project area during construction, they would be given the space and time required to leave the area per State and Federal regulations. In addition, no blasting or use of explosives will be used to demolish existing bridge structures. Therefore, no adverse impacts to this species are anticipated as a result of this proposed project. Pursuant to the USFWS determination key (USACE Manatee Effect Determination Key April 2013), a determination of “**may affect, not likely to adversely affect**” is anticipated for the West Indian manatee and its habitat.

Protection of smalltooth sawfish and sea turtles during all phases of bridge construction will be accomplished through the implementation of *Sea Turtle and Smalltooth Sawfish Construction Conditions (Appendix G)*. In addition, due to noise concerns for these species associated with pile driving, all piles for this project are to be constructed using drill shafts and no blasting or use of explosives will be used to demolish existing bridge structures. If any of the free-swimming species are found within the project area during construction, the animal would be given the space and time required to leave the area per State and Federal regulations. A determination of “**may affect, not likely to adversely affect**” is anticipated for the smalltooth sawfish, green turtle, leatherback sea turtle, Kemp’s Ridley sea turtle, hawksbill sea turtle, and loggerhead sea turtle.

Due to the highly-urbanized nature of the surrounding areas, little to no suitable wood stork foraging habitat is present. The use of the areas adjacent to the project as a foraging area for wading birds is limited to shallow littoral zones immediately adjacent to the Venetian Causeway bridges. Although wood storks may migrate through the project area, there are no emergent wetlands that could serve as core foraging area. There is also little to no suitable sandy beach or mudflat habitat for the piping plover. As such, it has been determined that the likelihood of these species occurring within the limits of this project is low. Therefore, no adverse impacts to these species are anticipated as a result of this proposed project. Pursuant to the USFWS Wood Stork Determination Key, a determination of “**no effect**” is anticipated for the wood stork. A “**no effect**” determination is also anticipated for the piping plover.

Although no American crocodiles were observed during field surveys, there is potential for this species to traverse the proposed project during construction. There is limited potential forage or suitable basking or nesting habitat within the urbanized areas in and adjacent to the proposed project. Therefore, no adverse impacts to this species are anticipated as a result of this proposed project and a determination of “**no effect**” is anticipated for the American crocodile.

Corals (including elkhorn and staghorn corals) were not observed on the bridge substructure during benthic surveys conducted in August 2014 and July 2017. Corals were observed encrusting the rip-rap areas around the undeveloped spoil islands between the main islands of the causeway: Spoil Island 1 between San Marco and San Marino Islands, Spoil island 2 between San Marino and Di Lido Islands, Spoil Island 3 between Di Lido and Rivo Alto Islands, and Spoil Islands 4 and 5 between Rivo Alto and Belle Islands. However, these corals are not listed species. These areas may be impacted during construction, as widening (14 feet on the south side and 12 feet on the north side) may require involvement with areas of the rip rap zone that are currently inhabited by corals. If impacts are anticipated during design, a conceptual mitigation plan will be prepared, and these impacts will be quantified via benthic survey. Corals in the area of potential impact will be inventoried and those suitable will be relocated per NMFS methodology prior to construction. Therefore, no adverse impacts to these species are anticipated as a result of this proposed project and a determination of “**may affect, not likely to adversely affect**” is anticipated for the elkhorn and staghorn corals.

Listed plant species which are potentially present within the project limits are limited to Johnson’s seagrass due to the extensive development located on the upland spoil islands and the absence of natural habitats. Johnson’s seagrass was not observed during the benthic survey of the project area, but the entire project corridor lies within the portion of Biscayne Bay that has been designated as Critical Habitat for the species by USFWS. The only seagrasses observed within the study limits included paddle grass (*Halophila decipiens*) and shoal grass (*Halodule wrightii*), but these species are commonly found in association with

Johnson’s seagrass. The observed seagrasses accounted for less than 1% of the surface coverage within the overall survey area and were not observed immediately adjacent to any of the project bridges to be reconstructed. The seagrasses present were typically documented around the outer limits of the benthic survey area, 55-60 feet from the bridge edges at their closest points. However, if barges are proposed to assist in the reconstruction of the bridges, care must be taken to prevent temporary impacts to the existing seagrass beds from temporary shading, scour or other potential issues.

Table 4-3 Effect Determinations for Federally Listed Species	
Species Name	Determination of Project Effect – Recommended Alternatives
Plants	
Johnson’s seagrass (<i>Halophila johnsonii</i>)	May affect, not likely to adversely affect
Birds	
Wood stork (<i>Mycteria americana</i>)	No effect
Piping plover (<i>Charadrius melodus</i>)	No effect
Mammals	
West Indian manatee (<i>Trichechus manatus</i>)	May affect, not likely to adversely affect
Reptiles	
American Crocodile (<i>Crocodylus acutus</i>)	No effect
Green turtle (<i>Chelonia mydas</i>)	May affect, not likely to adversely affect
Loggerhead sea turtle (<i>Caretta caretta</i>)	May affect, not likely to adversely affect
Kemp’s Ridley sea turtle (<i>Lepidochelys kempii</i>)	May affect, not likely to adversely affect
Leatherback sea turtle (<i>Dermochelys coriacea</i>)	May affect, not likely to adversely affect
Hawksbill sea turtle (<i>Eretmochyles imbricata</i>)	May affect, not likely to adversely affect
Fish	
Smalltooth sawfish (<i>Pristis pectinata</i>)	May affect, not likely to adversely affect
Corals	
Elkhorn coral (<i>Acropora palmata</i>)	May affect, not likely to adversely affect
Staghorn coral (<i>Acropora cervicornis</i>)	May affect, not likely to adversely affect

State Listed Species

Due to the highly-urbanized nature of the surrounding areas, little to no suitable foraging habitat is present for state-listed wading birds: tricolored heron, little blue heron, roseate spoonbill, and reddish egret. The use of the areas adjacent to the project as a foraging area for wading birds is limited to shallow littoral zones immediately adjacent to the Venetian Causeway, which will be avoided during construction. Although wading birds may migrate through the project area, there are no emergent wetlands that could serve as foraging area. Therefore, it has been determined that there will be “**no effect**” on the tricolored heron, little blue heron, roseate spoonbill, and reddish egret or their associated habitats.

The areas within and immediately adjacent to the project do not include mudflats, marshes, or beach habitat. Existing nearby beaches and mud flats will not be affected by the project. Therefore, it has been determined that there will be “**no effect**” on the black skimmer or least tern or their associated habitats.

Table 4-4 Effect Determinations for State Listed Species

Species Name	Determination of Project Effect – Recommended Alternatives
Birds	
Tricolored heron (<i>Egretta tricolor</i>)	No effect
Little blue heron (<i>Egretta caerulea</i>)	No effect
Roseate spoonbill (<i>Ajaia ajaja</i>)	No effect
Reddish egret (<i>Egretta rufescens</i>)	No effect
Black skimmer (<i>Rynchops niger</i>)	No effect
Least tern (<i>Sterna antillarum</i>)	No effect

4.5 Evaluation of Direct Effects on Protected Species and Habitat

FDOT has completed a thorough analysis of the design alternatives for the Venetian Causeway project to determine the potential affects to protected species and their habitats that are potentially present within the project corridor. The results of that analysis are described below.

No-Action / TSM&O Alternative

Direct impacts to protected species and habitat are not anticipated as a result of the No-Action Alternative, as there are no construction activities involved. This build alternative includes only routine maintenance performed as needed to keep the bridges open to traffic until safety issues would require them to be closed. This alternative does not include modification or improvements to the existing bridges or approach roadway.

Build Alternative – Rehabilitation

Direct impacts to protected species or their habitats are not expected as a result of the proposed Rehabilitation Alternative. There are no coral species on any of the bridge approaches, pilings or other structures that would be repaired or removed. In addition, there were no seagrasses (including Johnson’s seagrass) observed within 40-50 feet of any existing bridge. This would also allow the use of barges during construction, if carefully placed, to avoid the existing grass beds. The use of BMP’s during all construction activities would prevent temporary or permanent impacts to the any existing seagrasses and corals that may be present in waters adjacent to the project area. Barge use will be limited to areas that maintain a minimum of twelve (12) inches clearance above the bottom at MLW to avoid grounding the barge causing turbidity or other negative impacts to the substrate. Barges will not be in the same location for more than two (2) weeks to reduce shading impacts.

Build Alternative – Reconstruction

Direct impacts to protected species or their habitats are not expected in association with the Reconstruction Build Alternative. There are no corals on the seawalls or rip rap found at the bridge approaches. In addition, no corals were present on the existing bridge pilings or supports. There were no seagrasses underneath or immediately adjacent to any of the bridges or pilings that are to be replaced. The only seagrasses observed during the benthic surveys of the proposed project area were in scattered patches located 40-50 feet or farther away from the closest bridge to be replaced. There will be a slight increase in the overall shading from the bridges along the corridor (total of 0.71 acres) of substrate. However, there were no benthic resources identified as present in the habitat beneath the existing bridges

so no effects on protected species are expected. All barge activity will be limited to areas with a minimum of twelve (12) inches clearance at MLW and no barges will be docked / staged at the same location for more than two weeks at a time to minimize shading effects. Once construction has begun and deck surfaces are removed from existing bridges, barges will be staged in the footprint of the old bridge deck to avoid shading impacts to additional benthic habitats. The use of BMP's during all construction activities would prevent temporary or permanent impacts to the any existing seagrasses and corals that may be present in waters adjacent to the project area.

In addition, the USFWS had requested during the ETDM Screening Process that the existing bridges be removed without the use of explosives. Therefore, FDOT is committed to removing these bridges using demolition methods that do not involve blasting or the use of explosives.

4.6 Evaluation of Indirect Impacts to Protected Species and Habitat

No-Action / TSM&O Alternative

No indirect impacts to protected species or their habitats are anticipated as a result of the No-Action Alternative due to no construction activities occurring. One detrimental effect of this action alternative would be the continued discharge of untreated surface water flows from the bridges directly into the water of Biscayne Bay.

Build Alternative – Rehabilitation

No indirect impacts to protected species or their habitats would occur as a result of the Rehabilitation Build Alternative. There are no protected species present on the pilings or other structures to be refurbished or restored and there were none present in the immediately adjacent habitats. Once completed, encrusting organisms would be able to establish on these new structures resulting in a slight increase in potential habitat for corals. The conditions would be essentially the same as current conditions within the corridor after construction is complete.

Build Alternative – Reconstruction

No indirect impacts are anticipated as a result of the Reconstruction Build Alternative. As with the Rehabilitation Alternative, the post construction conditions will mimic the pre-construction conditions except for a slight increase in the overall shaded area beneath the bridge decks. Since there are currently no protected species present in these areas, no indirect effects are anticipated.

4.7 Evaluation of Cumulative Impacts to Protected Species and Habitat

Since the proposed construction will be in the same footprint as the existing bridges, the cumulative effects of the overall project are expected to be negligible. No changes in traffic volume or traffic patterns are expected so there should be no negative cumulative effect on the surrounding habitat. One positive result of the new construction will be a net reduction in direct pollutants by eliminating the direct discharge of stormwater from the existing bridges into Biscayne Bay. As such, the cumulative impacts to protected species or their habitats are expected to be negligible.

5.0 WETLAND EVALUATION

5.1 Wetland Survey Methodology

A desktop review was performed utilizing a combination of resources including a review of current aerial photography, GIS layers from the SFWMD, the NRCS (National Resources Conservation Service), U.S. Geological Survey (USGS), and field inspections were utilized to identify any potential jurisdictional wetland areas within the project corridor. During the ETDM Screening process, members of ETAT commented on potential project impacts to wetlands. Both FDOT District 6 and the USACE made the Determination of Effect (DOE) of “Substantial”, while the U.S. EPA, FDEP, and NMFS found the DOE to be “Moderate”. These determinations were based on the presence of estuarine wetlands, the potential for seagrasses and mangroves in the project area and the number of acres being impacted. Field surveys were conducted in August 2014 and July 2017, as well as November 2017 to document site conditions following hurricane Irma. The field reviews consisted of a pedestrian survey of the spoil islands along the causeway and the project termini on the City of Miami mainland and the City of Miami Beach.

The pedestrian survey included an inspection of the approaches on each end of every bridge within the corridor. In addition, each of the developed islands and undeveloped spoil islands were inspected for the presence of jurisdictional wetland habitats within the proposed project limits of each design alternative. Jurisdictional wetlands within the project area were delineated in compliance with the criteria specified in the 2010 USACE *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plan Region*, along with the Florida Department of Environmental Protection (FDEP) *Florida Wetlands Delineation Manual* (1995), and Chapter 62-340 Florida Administrative Code – *Delineation of the Landward Extent of Wetlands and Surface Waters*, and the FDOT PD&E Manual. The intent of the survey is to document any wetland and surface water features to minimize impacts to these water bodies (Executive Order 11990, Protection of Wetlands). The area inspected on these islands included the shoreline from the mean low water line to the edge of pavement. Other surface waters documented during this survey were inspected for surface water impacts only. For information on aquatic habitat inspected below the mean low waterline, please see **Section 6.0**. The field results were mapped in GIS and overlaid with conceptual project plans to provide seagrass and wetland impact acreages. Per the FDOT PD&E Manual, wetlands within the project area were classified using the FLUCFCS and the Cowardin Classification System. Biologists familiar with South Florida flora and fauna communities conducted the surveys.

5.2 Wetland Assessment

The National Wetlands Inventory database identifies 52.8 acres (39.88%) of estuarine wetlands within the 200-foot project buffer (ETDM report #12756). The project corridor consists of 12 bridges connecting mainland Miami with the City of Miami Beach via a series of spoil islands (six developed and five undeveloped) across Biscayne Bay. Seawalls line the mainland and developed spoil islands with riprap present along the waterward side of the seawalls. The undeveloped spoil island’s shorelines are hardened with riprap, but are without seawalls. The soils present throughout the entirety of all islands along the corridor are classified by NRCS as Urban Land. The Urban Land soil present on these islands consists of unconsolidated sand/shell fill material, which is generally not suitable for wetland habitat. The bridge approaches of all bridges within the project corridor have seawalls faced with rip rap in every location. There were no mangroves, buttonwoods other trees present at these approaches. In addition, there were

no herbaceous vegetative species growing within the rip rap or at the face of the seawalls at these bridge approaches.

Biscayne Island contained two wetlands and a dry stormwater retention area in the southeast corner of the island. The remaining five (5) developed spoil islands (San Marco, San Marino, Di Lindo, Rivo Alto and Belle Island) were inspected and no jurisdictional wetlands were observed within or adjacent to the areas of proposed construction for any design alternative. There were also five (5) undeveloped spoil islands that were inspected during this jurisdictional wetland assessment. The undeveloped spoil islands will be referred to as spoil islands “A” – “E”, moving west to east, for the purposes of this report (**Appendix H**). Three of the islands, “A”, “B” and “D”, had planted coconut palms, planted buttonwood and planted sea grapes on either side of the existing road. The remainder of each of these islands was mowed and maintained sod. There were no jurisdictional wetlands on any of these three spoil islands. Photographs from this inspection are located in **Appendix B**. Detailed descriptions of each wetland are listed below:

OSW 1: Estuarine – Cowardin: E2RS2Cr – estuarine, intertidal, rocky shore, rubble, seasonally flooded, artificial

The first developed spoil island from the west (Biscayne Island) contains a small rectangular retention area classified as an other surface water (OSW), located south of the toll plaza, near the southern seawall. This other surface water (OSW 1) is dominated by a dense monoculture of saltgrass (*Distichlis spicata*) and is regularly mowed and maintained. OSW 1 occurs outside of the project footprint for all design alternatives.

OSW 2 Biscayne Bay - FLUCCS: 5410 – Embayments Opening Directly to Gulf or Ocean

This project encompasses the rehabilitation or replacement of 12 bridges that span across the Venetian Islands and over the Biscayne Bay (OSW 2). The Biscayne Bay is an Outstanding Florida Water and the project corridor lies within the Biscayne Bay Aquatic Preserve. This project will result in several minor direct and indirect impacts to the surface waters of the Biscayne Bay in the form of shading, turbidity and additional impervious surface. These temporary impacts are present in all design alternatives other than the No-Action Alternative.

Wetland 1: Estuarine – Cowardin: E2RS2Cr – estuarine, intertidal, rocky shore, rubble, seasonally flooded, artificial

Wetland 1 is located between OSW 1 and the southern seawall of Biscayne Island. Herbaceous vegetation identified within this wetland included Sea oxeye daisy (*Borrchia frutescens*), sea purslane (*Sesuvium portulacastrum*) and seashore paspalum (*Paspalum vaginatum*). This area is mowed and maintained, but classifies as a disturbed artificial wetland. Wetland 1 occurs outside of the project footprint for all design alternatives.

Wetland 2: Estuarine – Cowardin: E2RS2N - estuarine, intertidal, rocky shore, rubble, regularly flooded

The largest mangrove wetland observed within the project corridor is located to the east of OSW 1 within Venetian Causeway Park on Biscayne Island. This mangrove system is located within the intertidal zone on the southern edge of this island and extends approximately 950 feet to the east. The width varies from 25’ to 65’ in the western portion of the wetland to 15’ to 25’ in the eastern end of the wetland. This eastern end of the wetland appears to have been heavily damaged by the recent hurricane as many of the trees have broken limbs and evidence of recent trimming via chainsaw. This wetland is well outside

the limits of proposed construction for all design alternatives. As such, no wetland impacts are expected in this jurisdictional wetland.

Wetland 3: Estuarine – Cowardin: E2RS2P - estuarine, intertidal, rocky shore, rubble, irregularly flooded

Spoil Island “C” contains a small area along the northern shoreline where a few naturally recruited buttonwoods, white mangroves and red mangroves were growing within the rip rap of the intertidal zone. Saltwort (*Batis maritima*) was also present in several areas near the MHW of the small wetland area. This area constitutes a jurisdictional wetland. The remainder of the island is vegetated with planted coconut palms and sea grapes, as well as sod that is regularly mowed and maintained. This small wetland habitat is not within or adjacent to the proposed construction area and no impacts are expected.

Wetland 4: Estuarine – Cowardin: E2RS2P - estuarine, intertidal, rocky shore, rubble, irregularly flooded

On Spoil Island “E”, a few small naturally recruited buttonwoods were observed on the northern shoreline within the rip rap of the intertidal zone. The remainder of this island is vegetated by sparse sod that is routinely mowed and a few scattered sea grapes that have been planted. This small habitat constitutes a jurisdictional wetland that will not be affected as it is not within or adjacent to the proposed construction area.

5.3 Evaluation of Direct Impacts to Wetlands

Presidential EO 11990 entitled "Protection of Wetlands" dated May 23, 1977, establishes a national policy to "avoid to the extent possible the long-term and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative." The United States Department of Transportation (USDOT) in implementing EO 11990 set forth its policy on wetlands in USDOT Order 5660.1A, "Preservation of the Nation's Wetlands," dated August 24, 1978, which is "to assure the protection, preservation, and enhancement of the Nation's wetlands to the fullest extent practicable during the planning, construction, and operation of transportation facilities and projects." In accordance with this policy, FDOT has evaluated all viable alternatives to determine the extent of impacts to wetland and surface water functions and values. Impacts to EFH are discussed and quantified in **Section 6.0**.

Table 5-1 Permanent Direct Impacts

Wetland/Other Surface Water	No-Action Alternative/TSM&O Impact Acreage	Rehabilitation Build Alternative Impact Acreage	Reconstruction Build Alternative Impact Acreage
OSW 1	0	0	0
OSW 2	0	0.82	0.82
Wetland 1	0	0	0
Wetland 2	0	0	0
Wetland 3	0	0	0
Wetland 4	0	0	0
Total	0	0.82	0.82

No-Action/TSM&O Alternative

Direct impacts to wetlands or other surface waters are not anticipated as a result of the No-Action Alternative, as there are no construction activities involved. This build alternative includes only routine maintenance performed as needed to keep the bridges open to traffic until safety issues would require them to be closed. This alternative does not include modification or improvements to the existing bridges or approach roadway.

Build Alternative – Rehabilitation

There are no direct impacts to wetlands or OSW 1 anticipated in association with the Rehabilitation Build Alternative. Each wetland is located outside of the project footprint for this build alternative. Temporary direct impacts to the surface waters of the Biscayne Bay (OSW 2) associated with this build alternative include impacts to water quality due to construction activities, and shading from barge use. These impacts will be minimal, as the use of BMPs will avoid and minimize potential temporary impacts. Appropriate turbidity control measures will be used during construction activities to mitigate for temporary water quality impacts, and barges will be instructed to avoid docking in the same location for more than two (2) weeks, and a minimum clearance of 12 (twelve) inches to minimize temporary shading impacts associated with this alternative.

Build Alternative – Reconstruction

No direct impacts to wetlands or OSW 1 are anticipated in association with the Reconstruction Build Alternative. Each wetland is located outside of the project footprint for this build alternative. A permanent direct shading impact to OSW 2 of 0.82 acres will occur as a result of proposed bridge deck widening. The installation of additional piles to each bridge will also result in a permanent impact to OSW 2. Temporary impacts to OSW 2, such as: water quality due to construction activities, and shading from barge use, are associated with this build alternative. These impacts will be minimal, as the use of BMPs will avoid and minimize potential temporary impacts. As with the Rehabilitation Build alternative, appropriate turbidity control measures will be used during construction activities to mitigate for temporary water quality impacts. Barges will be instructed to avoid docking in the same location for more than two (2) weeks, and a minimum clearance of 12 (twelve) inches to minimize temporary shading impacts associated with this alternative. Additionally, during the early stages of construction of each deck, barges will be stationed within the existing deck footprint, minimizing shading impacts to the adjacent surface waters.

5.4 Evaluation of Indirect Impacts to Wetlands

No-Action/TSM&O Alternative

Indirect impacts to wetlands or OSW 1 are not anticipated as a result of the No-Action alternative, as there are no construction activities involved. OSW 2, under existing conditions, is impacted by direct stormwater drainage into OSW 2 via scuppers. The Rehabilitation and Reconstruction build alternatives include the installation of a stormwater management system that would collect and treat this stormwater. Choosing this alternative would result in the continued drainage of untreated stormwater directly into the Biscayne Bay. There are no other indirect impacts associated with this project.

Build Alternative – Rehabilitation

There are no indirect impacts to wetlands anticipated as a result of the Rehabilitation Build Alternative. Permanent impacts are not anticipated to uplands existing adjacent to any wetland along the corridor, maintaining current upland buffers. There will be no indirect impacts to OSW's within the project corridor as there will be no additional impervious surfaces, and the installation of a stormwater management system will result in water quality improvements compared to baseline conditions and the No-Action Alternative.

Build Alternative – Reconstruction

No indirect impacts to wetlands are anticipated as a result of the Reconstruction Build Alternative. As with the Rehabilitation Build Alternative, indirect impacts are not anticipated to uplands existing adjacent to any wetland along the corridor, maintaining current upland buffers. This build alternative would create additional impervious surface on the bridge decks. However, the installation of a stormwater management system would mitigate for this additional impervious surface and result in net water quality improvements compared to baseline conditions and the No-Action Alternative.

5.5 Evaluation of Cumulative Impacts to Wetlands

The new construction will follow the same alignment as the existing causeway, and vehicle capacity will not be increased. Dominant land uses surrounding the project area consist of residential and commercial, and public and semi-public, which is not anticipated to change post-construction. Therefore, the Rehabilitation Build Alternative and the Reconstruction Build Alternative are not expected to promote new development or encourage changes in existing or future land use.

There will likely be no cumulative impacts as a result of this project. The project area is located within the Cities of Miami and Miami Beach, which are urbanized and effectively built-out with little to no remaining vacant land. Ongoing and future development is likely to be in the form of reconstruction or redevelopment of existing facilities. Planned improvements are to be constructed within the existing right of way and include improvements to the stormwater management system. Therefore, it is anticipated that cumulative impacts to wetlands or other surface waters from the proposed action, when combined with other past, present, and future projects, would be insignificant.

6.0 ESSENTIAL FISH HABITAT ASSESSMENT

The 1996 amendments to the MSFCMA reflects the Secretary of Commerce and Fishery Management Council's authority and responsibilities for the protection of important marine and anadromous fish habitat. The MSFCMA set forth a mandate to NMFS and regional fishery management councils (FMC) to designate EFH for species managed under federal Fishery Management plans (FMPs).

EFH is defined in the MSFCMA as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." FMPs are prepared by regional FMCs and contain information pertaining to conservation and management measures for each specific fisheries' resources as well as other provisions required by the MSFCMA. Subsets of EFH that are designated based on ecological importance, susceptibility to human-induced environmental degradation, susceptibility to stress from development, or rarity of the habitat type are referred to as EFH HAPCs. HAPCs are identified by the region's specified Fishery Management Council. The regional FMC that has jurisdiction over South Florida is the South Atlantic Fishery Management Council (SAFMC). The SAFMC is responsible for generating and maintaining the FMPs for the South Atlantic region (See the Map Below for the SAFMC Management Boundary Line).



Figure 6-1 Marine Areas Managed by the South Atlantic Fishery Management Council (SAFMC)

(NOAA NMFS, <http://safmc.net/>).

FMPs outline and describe the physical, biological and chemical features of EFH and contain information pertaining to a species life history stages, maps with defined boundaries of species ranges, potential threats and recommended conservation and enhancement measures. The SAFMC manages eight (8) FMPs in the South Atlantic Region: 1) Snapper-Grouper, 2) Coastal migratory pelagic species, 3) Shrimp, 4) Spiny

lobster (*Panulirus argus*), 5) Corals, coral reef and live/hardbottom, 6) Golden crab, 7) Dolphin and wahoo, as well as 8) Sargassum.

In 1996, the MSFCMA was amended to establish a new requirement to identify and describe EFH to protect, conserve and enhance EFH for the benefit of the federally managed fisheries. EFH consultation is required for federal projects as well as projects requiring federal actions, such as a federal permit (i.e. USACE permit) (FDOT PD&E Manual). The Venetian Causeway PD&E study is a federally funded project that has potential to impact EFH and species within FMPs as designated by the SAFMC; therefore, an EFH assessment was performed for the project area within Biscayne Bay.

6.1 Project Background

The proposed project along the Venetian Causeway occurs within Biscayne Bay Aquatic Preserve (BBAP) and will involve in-water work; hence, the project has the potential to directly and indirectly impact benthic resources and habitats that have been designated as EFH by the SAFMC. Based on the information within the FMPs from the SAFMC, Biscayne Bay contains EFH for several federally managed species within the following five FMPs: Snapper-Grouper complex; Spiny lobster; Red drum (*Sciaenops ocellata*); Coral, Coral Reef, and Live/Hardbottom; and Shrimp. The species managed in these FMPs would likely utilize the EFH within Biscayne Bay during their larval, juvenile, and sub-adult stages, particularly March through September during the snapper and grunt spawning season. In addition, Biscayne Bay provides shelter and foraging habitat for West Indian manatees, several species of sea turtle as well as over 300 species of fish and macroinvertebrate species. Biscayne Bay is also considered an OFW, which means it is subject to additional or special protection because of its natural attributes. Furthermore, the NMFS has designated critical habitat for Johnson's seagrass and the USFWS designated critical habitat for the West Indian manatee within the limits of Biscayne Bay. Overall, Biscayne Bay plays an important role in the life cycles of numerous estuarine and marine species and therefore merits a high level of regulatory protection and conservation.

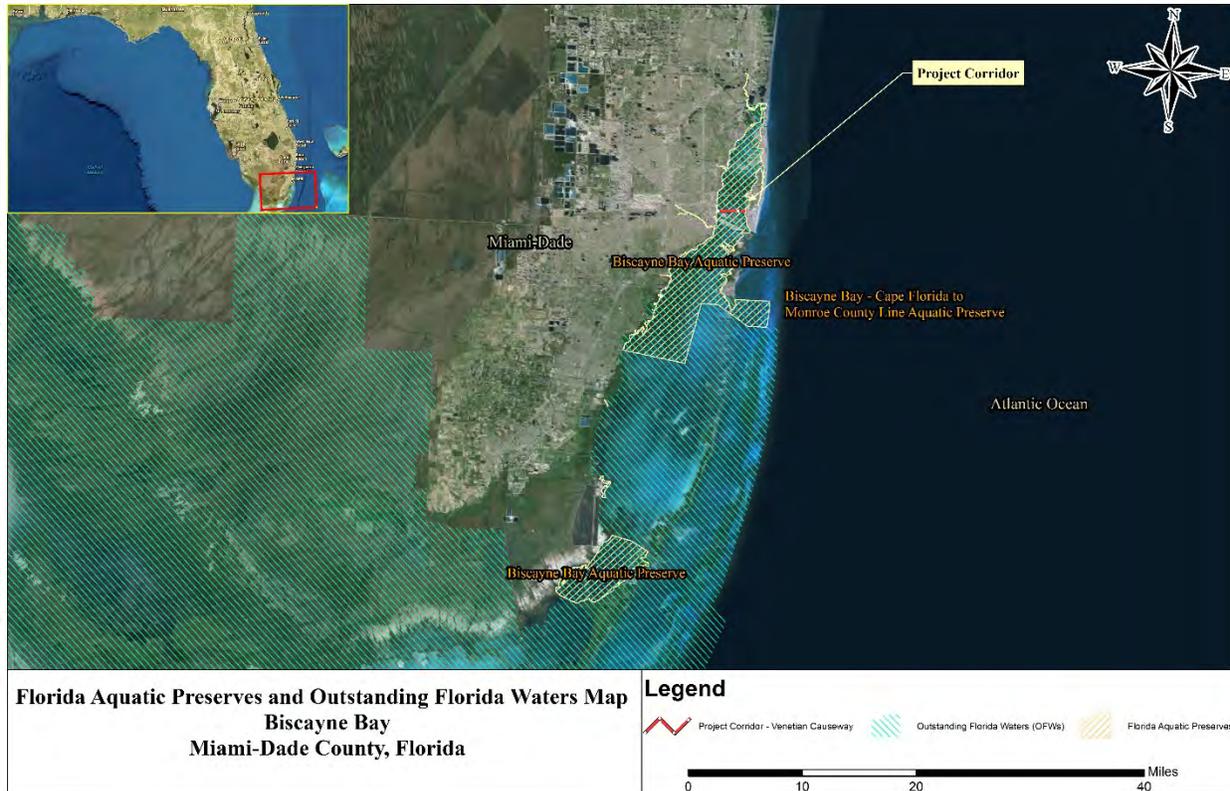


Figure 6-2 Florida Aquatic Preserves and Outstanding Florida Waters Map Biscayne Bay

NMFS indicated in the 2011 ETDM Programming Summary Report No. 12756 that Biscayne Bay, within the project area, has the following moderate to high quality habitat types: sand and shell bottom, corals, macroalgae, sponges, and seagrass. These bottom types typically provide foraging areas for managed fish species, manatees, sea turtles, and invertebrates as well as shelter and habitat for post-larval and juvenile fish species. The live/hardbottom and corals, and seagrasses are HAPCs and Biscayne Bay itself has been geographically designated a HAPC for the spiny lobster. NMFS determined the degree of effect for this project on the Coastal and Marine natural environment as “substantial.”

Biological characterization surveys of the benthic habitat underneath and adjacent to all 12 of the Venetian Causeway bridges within the project area were performed in August 2014 and again in July 2017. The purpose of these surveys was to identify the marine EFH and benthic resources within the project area that could potentially be impacted by the project and to determine their limits to avoid and minimize impacts to these resource areas. The results of these surveys served as the basis for this EFH assessment and are discussed in the following sections.

6.2 Benthic Survey Methodology

Field investigations were conducted in August 2014 and again in July 2017 to identify and characterize benthic habitats and associated marine resources within a 60-foot buffer area around the 12 Venetian Causeway Bridges being evaluated in the PD&E study. This buffer distance was chosen to accommodate the proposed bridge footprint and largest barge corridor anticipated based on standard barge widths that

may be used during construction. The 2014 study did not cover the westernmost 750 feet of Bridge No. 1 as this area was under emergency construction repairs at the time of the survey and was inaccessible. However, the 2017 field investigation included this area. This project is located within Johnson's Seagrass critical habitat (See **Johnson's Seagrass (*Halophila johnsonii*) Critical Habitat Map Figure 6-3**); therefore, the survey was conducted during Johnson's Seagrass growing season, which has been determined by NMFS to be June 1-September 30 (NOAA NMFS, 2010).

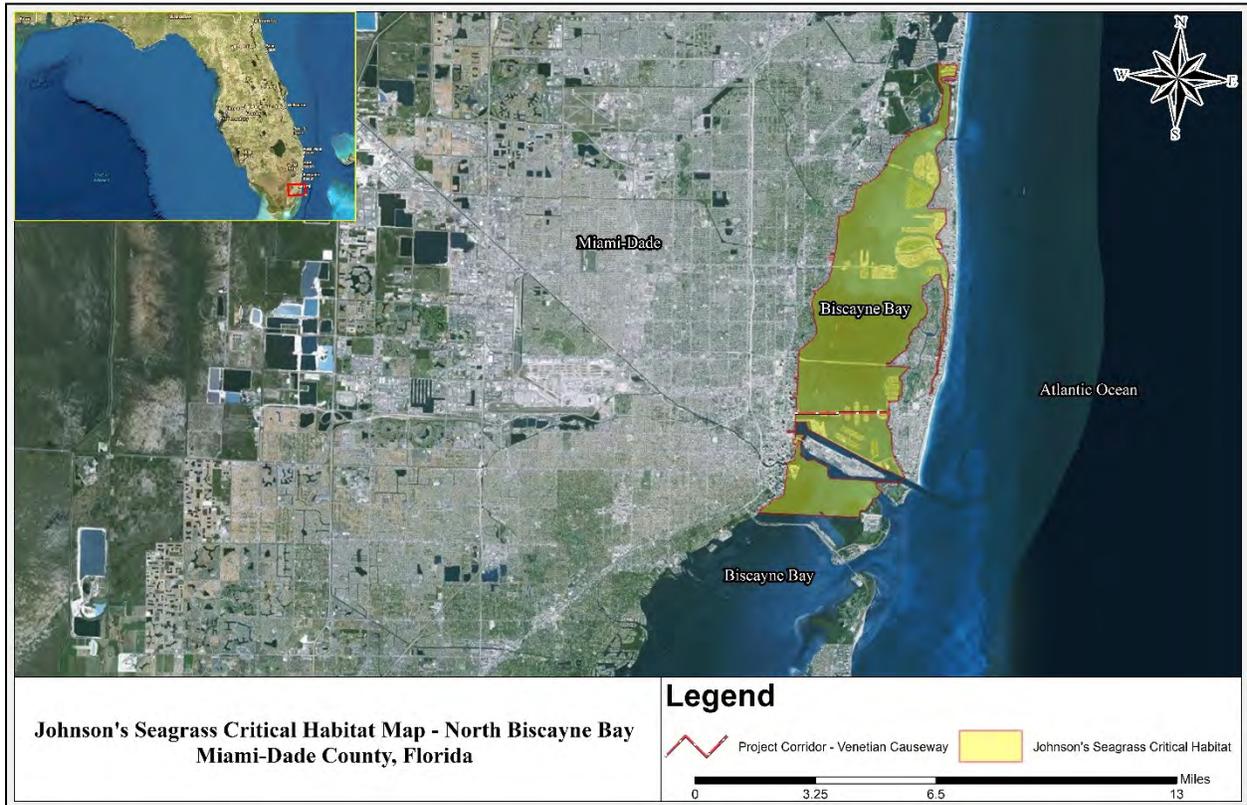


Figure 6-3 Johnson's Seagrass Critical Habitat within the Project Area (Biscayne Bay).

From July 9th to July 11th, 2017, biologists conducted biological characterizations of the benthic conditions at each of the 12 bridges to 60 feet on both the north and south ends of each bridge. Each bridge was surveyed via the use of perpendicular transects from the bridge edges out to 60 feet starting at the end bents. This transect process was done for both the north and south sides of each bridge and repeated at consecutive bridge pilings (or every other piling if benthic conditions had been determined to be uniform per the previous transect data and meandering swims) to the opposite end bent for each bridge. The surveys also documented the benthic conditions underneath the bridges and each bridge piling was surveyed for coral/sponge coverage and depth (See **Appendix D** for the **Benthic Communities Assessment Report**).

The surveys were conducted during all tidal cycles; however, it should be noted that several bridges in this survey area experience high velocity tidal currents. As such, slack tides (relatively brief in duration) were utilized to their greatest extent to maximize survey efficiency. Water depth varied between zero (0) and 15 feet, and the visibility varied between three (3) and 10 feet. The general limits of the observed

benthic resources were mapped using a combination the data points taken in the field using the Trimble Global Positioning System (GPS) unit.

Benthic Survey Results

The surveys documented that the existing benthic community was fairly uniform throughout the study area. The benthic conditions directly underneath these bridges (outside the photic zone) was typically bare sand substrate. Upon entering the photic zones, three distinct benthic communities were observed within the survey area: Community 1) the shallow, subtidal zones, bridge pilings & rip-rap/rubble/hard debris areas, Community 2) the deeper water, sandy bottom with shell fragments areas and, Community 3) the seagrass patch areas.

Below the bridge edges, and on/adjacent to the bridge pilings (inside the photic zone), the underwater habitat is comprised of a dense sponge, octocoral and tunicate community. Several small, stony corals (mostly less than 10 cm in diameter), were found in this community mainly attached to rubble/rip-rap near the bridge end-bents. No stony corals were documented on any bridge structure (i.e. piling, fender, or end bent). Heading further out, water-ward from the bridges, the benthic environment transitions, to an unconsolidated, sandy bottom with shell fragments, which has a fluctuating coverage of macroalgae and sponges, octocorals and tunicates. Although this region of Biscayne Bay is designated as critical habitat for Johnson's seagrass, this threatened seagrass was not observed within the survey area. The seagrasses observed (Community No. 3) within the study limits included paddle grass and shoal grass. These observed seagrasses accounted for less than 1% of the surface coverage within the survey area, were not observed adjacent to any of the project bridges, and were typically documented around the outer limits of the survey, 55-60 feet from the bridge edges.

The high velocity currents that portions of Community Nos. 1 and 2 are exposed to becomes diminished further from the bridges (around the survey limits) and isolated patches of seagrass were observed in these areas (Community No. 3) at Bridges 1(N), 2 (S), 3(S), 4(N-S), 6(S), 8(N) and 12(N-S). Paddle grass was the main species of seagrass found in the survey area; however, shoal grass was observed at Bridge 1(S). The shoal grass was very sparse and was observed only in a mixed species seagrass patch alongside paddle grass.

6.2.1 Community No. 1: The Shallow, Subtidal Zones, Bridge Pilings, & Rip-Rap/Rubble/Hard Debris Areas

Community No. 1 was observed within the subtidal zone located at the eastern and western termini (the end bents) of each bridge as well as the bridge pilings and fenders (within the photic zone), and the areas immediately adjacent to these vertical structures. The benthic substrate in this community was primarily rip-rap, rubble and/or hard debris which was dominated by sponges and tunicates. The depth at the bridge pilings ranged from 8-12 feet deep and the area around these pilings experiences high velocity tidal currents with little abatement. The intertidal/littoral areas of this community type are relatively sheltered from the high velocity currents by the rip-rap/rubble/hard debris and bridge structure and generally occurred in the shallower waters (less than 5 feet) bordering the shorelines. These hardbottom features currently provide substrate for a variety of marine organisms, including algae, sponges, hard (*Scleractinia*) corals, soft (*Octocorallia*) corals, polychaetes, mollusks, crustaceans, echinoderms, and tunicates.

Coverage by the above organisms within this community type ranged between 25-100%. The sponges, octocorals and tunicates were noted to amass and form densely packed, mix species assemblages on and/or around each other or on any of the hard-benthic structures. These mixed-species assemblages become less dense around the edges of these aggregations and/or hard-benthic structures. The most abundant organisms were by far the sponges; in particular, the vase, barrel, fire, and blackball sponges. The hard corals found within this community were typically small, isolated lesser starlet coral (*Siderastrea radians*) and the majority were documented colonizing the rip-rap/hardbottom debris. Other coral species included: round starlet coral (*Siderastrea siderea*), ivory brush coral (*Oculina diffusa*), rose coral (*Manicina areolata*), and grooved brain coral (*Diploria labyrinthiformis*), knobby star coral (*Solenastrea hyades*), blushing star coral (*Solenastrea bournoni*). These corals occurred much less frequently and most corals in this community had diameters of less than 10 cm. Only a few isolated corals measuring greater than 10 cm were observed in this community and were mainly found on rip-rap around the areas where the rip-rap begins to elbow out away from the bridges at the eastern/western limits of the survey areas towards the rip-rap shorelines between bridges. No hard corals were observed utilizing any bridge structure (aka pilings, fenders, or end bents) in this community throughout the entire 12 bridge survey area. It should be noted that none of the observed species of coral are listed as threatened or endangered by NOAA NMFS. The fish and fauna observed in this community were generally small and/or juvenile snappers, grunts, angelfish, rays, skates and other common reef fish and invertebrate species. Representative photographs and further details on this community can be found in the **Benthic Communities Assessment Report** attached in the **Appendix D**.

This Community as described here contains the following EFH types as designated by the SAFMC: 1) Corals, Coral Reefs, and Live/Hardbottom, 2) Sponges and, 3) Algal Communities, 4) Shallow, Subtidal bottom and, 5) Rough, hard, exposed stable substrate (etc.). These EFH types provide habitat for species within the following FMPs as determined by the SAFMC: Red Drum, Snapper-Grouper complex, Spiny lobster and Corals. More detailed information for the species encompassed by these FMPs can be found in **Section 6.3** of this document.

6.2.2 Community No. 2: The Deeper Water, Sandy Bottom with Shell Fragments Areas

Community No. 2 was observed beginning approximately five (5) to 15 feet from the bridge edges. Water depth in this community varied between eight (8) and 15 feet. The benthic conditions in this community type were characterized primarily as sandy bottom with shell fragments and consisted of varying coverages of red, green, and/or brown macroalgae and a similar suite of sponges, octocorals, and tunicates as in Community No. 1. The coverage of these macroalgae and sponges ranged between 10-90% throughout this area. Portions of this community are subject to similar high velocity currents as Community No. 1; however, unlike Community No. 1, there is not as much relief and structure to abate this current. Without the current diminishing relief and structure, sponge aggregations tended to be smaller in this community and were usually found on randomly scattered debris or growing around/on other established sponges/footholds. The remainder of the sandy bottom with shell fragments (unconsolidated bottom) area was mostly dominated by red, green, and/or brown macroalgae. Representative photographs and further details on this community can be found in the **Benthic Communities Assessment Report** in the **Appendix D**.

This Community as described here contains the following EFH types as designated by the SAFMC: 1) Live/Hardbottom, 2) Sponges, 3) Algal Communities, and 4) Unconsolidated Bottom. These EFH types provide habitat for species within the following FMPs as determined by the SAFMC: Red drum, Snapper-grouper complex, and spiny lobster. Specifically, the macro algae species *Laurencia sp.* provides EFH for the spiny lobster. More detailed information for the species encompassed by these FMPs are further described in **Section 6.3** of this document.

6.2.3 Community No. 3: The Seagrass Patches

Community No. 3 was documented at seven (7) of the 12 bridges along the Venetian Causeway (1(N), 2 (S), 3(S), 4(N-S), 6(S), 8(N) and 12(N-S)). This community contained the seagrass patches which were mostly small, isolated, monospecific patches of paddle grass. This community tended to be found around the outer limits of the survey area (about 55-60 feet from the bridge edges) and was comprised of similar benthic substrate as observed in Community No. 2, sandy bottom with shell fragments. The depths in this community ranged from eight (8) to 14 feet. Occurrences of sponges, tunicates and other soft-coral organisms were much sparser in these seagrass areas and the coverage of macroalgae (specifically the green macroalgae, *Batophora sp.*) tended to be higher in these areas (25-75% macroalgal coverage). The southwestern quadrant of the survey area at Bridge 1 was the only area where shoal grass was observed, and this species was documented alongside paddle grass in a mixed species patch. This community was the least abundant community in the survey area and, although documented at over half of the bridges along the Causeway, the seagrasses patches typically cover only a few square feet and all occurrences were observed at least 40 feet from the bridge edges. Over the entire survey area for the 12 bridges (over 16 acres of survey area), only approximately 0.06 acres of this community type was documented (less than 1% of the survey area). In addition, the seagrasses within these patches generally had a visually estimated 1-15% coverage. Representative photographs and further details on this community can be found in the **Benthic Communities Assessment Report** in the Appendix.

This Community as described here contains the following EFH types as designated by the SAFMC: 1) Estuarine and Marine Submerged Aquatic Vegetation (SAV), 2) Unconsolidated Bottom and 3) Algal Communities. These EFH types provide habitat for species within the following FMPs as determined by the SAFMC: Shrimp, Red drum, Snapper-grouper complex, and is a HAPC for the spiny lobster and species within the snapper-grouper complex. More detailed information for the species encompassed by these FMPs are further described in **Section 6.3** of this document.

6.3 Essential Fish Habitats & Fishery Management Plans

Per a review of the EFH designations from the SAFMC and the results from the biological characterization surveys, there were seven (7) EFH types observed within the study area for the Venetian Causeway PD&E. The EFH types and associated five (5) FMPs within the project's study area are listed below alongside the Community type (as described in **Section 6.2**) these habitats were observed in:

Table 6-1 Essential Fish Habitats within Venetian Causeway Study Area		
EFH Type	FMP	Community Present
Estuarine & Marine Submerged Aquatic Vegetation	Shrimp, Red Drum, Snapper-Grouper, Spiny Lobster	3
Unconsolidated Bottom	Red Drum, Snapper-Grouper, Spiny Lobster	1, 2, 3
Live/Hardbottom	Snapper-Grouper, Spiny Lobster	1, 2
Shallow Subtidal bottom	Spiny Lobster	1
Sponges	Spiny Lobster	1, 2
Algal Communities	Spiny Lobster	1, 2, 3
Rough, hard, exposed, stable substrate in subtidal to outer shelf depths, subtropical, within a wide range of salinity and turbidity levels sufficiently low enough to provide algal symbionts adequate sunlight penetration for photosynthesis	Coral	1

The following summarizes the EFH types within the Venetian Causeway study area. Seagrasses are included in the Estuarine and Marine SAV EFH type as they provide important ecological functions including: sediment stabilization, primary productivity, structural complexity, substrate for attachment and/or productivity for epiphytes, wave energy abatement (shoreline stabilization), nutrient cycling and carbon sequestration, as well as water quality improvements. Both shoal and paddle grasses were noted in Community No. 3 within the study area. Unconsolidated Bottom EFH type generally describes bare, non-stable substrate which typically provides habitat for marine organisms to live on or within the substrate (i.e. macroalgae). This EFH type was observed in all three (3) Communities and contains substrate comprised of mainly sandy bottom with shell fragments within the study area. The Live/Hardbottom EFH type includes the typical reef building organisms (stony corals and sponges, tunicates, octocorals) that form assemblages with low to moderate relief on hard-benthic substrate that provides: areas for fish forage and shelter, wave energy abatement and shoreline stabilization, as well as nutrient cycling benefits (SAFMC A14 2016). This EFH type was observed within Community Nos. 1 and 2 within the study area but was most prevalent in Community No. 1. The Shallow Subtidal Bottom and Rough, Hard, Exposed, Stable Substrate in Subtidal Depths and Subtropical Conditions (etc.) EFH types are basically subsets of the Live/Hardbottom EFH type and describe the shallow, submerged shoreline areas that provide similar relief and hardbottom substrate. These EFH types were observed exclusively in Community No. 1. The Algal and Sponge Community EFH types both serve similar ecological functions as the Live/Hardbottom EFH type and are important forage and shelter areas for numerous marine organisms including the spiny lobster which were observed utilizing the crevices created by the sponges. The algal communities were observed in all three (3) Communities while the sponge community was only observed in Community Nos. 1 and 2. These important EFH types all exist within the Venetian Causeway PD&E study area and currently provide moderate to good quality habitat to numerous federally managed marine species.

6.3.1 Habitat Areas of Particular Concern

HAPCs are defined as specific subsets of EFH that provide critically important ecological functions or are especially vulnerable to degradation. FMPs may designate a specific habitat area as an HAPC based on ecological importance, susceptibility to human-induced environmental degradation, susceptibility to stress from development, or rarity of the habitat type. The following chart identifies the HAPCs present within the Venetian Causeway project area and what FMPs these EFH habitats are considered HAPCs for:

Table 6-2 Habitat Areas of Particular Concern within Study Area	
HAPC	FMP
Biscayne Bay	Corals, Spiny Lobster
Coral, Coral Reefs and Live/Hardbottom	Corals, Spiny Lobster
Seagrass Habitat	Snapper-Grouper, Red Drum

6.3.1.1 Biscayne Bay

The entirety of the study area for the Venetian Causeway PD&E is located in the BBAP which is designated as OFWs and contains critical habitat for the threatened Johnson’s Seagrass and West Indian manatee. Johnson's seagrass was the first and only marine plant to be listed as threatened and is known to reside in the northern section of BBAP. Biscayne Bay has two designated aquatic preserves within its limits. BBAP, was established in 1974 and runs the length of Biscayne Bay from the Oleta River down to Card Sound near Key Largo. Biscayne Bay-Cape Florida to Monroe County Line, is the other aquatic preserve and this was established in 1975. Much of the submerged lands and islands originally included within the Cape Florida to Monroe County boundaries are now within either Biscayne National Park or within the larger BBAP; hence, the preserves are collectively known as the BBAP which is approximately 64,607 acres (FDEP 2017).

Biscayne Bay provides habitat for a wide variety of juvenile and adult marine species as well as several of Florida's imperiled species, including the smalltooth sawfish and the American crocodile. The benthic habitat(s) contained within Biscayne Bay are substantially important ecologically and have been geographically designated as a HAPC by the SAFMC for species within the Coral FMP as well as the Spiny Lobster FMP.

6.3.1.2 Coral, Coral Reefs and Live/Hardbottom

The coral, coral reefs and live/hardbottom habitats located off the southeast coast of Florida are the primary natural reef builders in the region (SAFMC 2017). These habitats provide shoreline stabilization which protects nearby beaches and are utilized by over 500 species of fishes, invertebrates, and plants. Live/Hardbottom habitats are often centrally located between mid-shelf reefs to the east and estuarine habitats within inlets to the west. As such, they serve as settlement habitats for larvae or as intermediate nursery habitats for juveniles migrating in/out of coastal inlets. Nearshore reefs abate wave and current energy and are vital in the protection against coastal erosion.

The SAFMC has designated coral, coral reefs and live/hardbottom habitat as a HAPC for species within the Coral FMP and the Spiny Lobster FMP. Spiny lobster and several species of corals were documented within the Venetian Causeway study area. The documented corals were all limited to Community No. 1, were mainly observed on hard-benthic debris and rip-rap, were primarily under 10 cm in size, and were infrequently observed within the study area. In addition, there were no corals observed on any existing bridge structure (pilings, fenders and/or end bents). Spiny lobster were also observed utilizing the habitat within Community No. 1 and were occasionally observed within Community No. 2 as well. While there were no “reef” areas within the study area (i.e. corals were observed as isolated individuals rather than multi-species collections), the live/hardbottom habitat that is present in Community Nos. 1 and 2 currently provides habitat for corals and spiny lobster. It should be noted that, by area, the corals were the least abundant marine resource observed within the study area.

6.3.1.3 Seagrass Habitats

Seagrass habitats throughout the tropics directly benefit multiple fishery resources by providing important nursery as well as forage habitat. Seagrass is part of a habitat complex that includes mangrove and hardbottom, other SAV and is known to be historically abundant throughout Biscayne Bay. Seagrasses support a diverse community of fish and invertebrates within the BBAP area and provide critical water quality maintenance functions, stabilize sediments, diminish wave action, and produce and export detritus materials which is a key component to several estuarine and marine ecosystems. Several species of seagrass are known to exist within Biscayne Bay including paddle grass, shoal grass, turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*), wideon grass (*Ruppia maritima*) and star grass (*Halophila engelmanni*). The northern area of BBAP (within the study area) also contains critical habitat for Johnson’s seagrass and, as previously discussed, this seagrass was the first and only marine plant to be listed as threatened and had been historically documented in the northern section of this aquatic preserve. In the South Atlantic region, all seagrasses occur on unconsolidated sediments in a wide range of physical settings and different stages of meadow development leading to a variety of cover patterns, from patchy to continuous. Seagrass patches form and migrate across the sea bottom, and in high current environments, movement is considerable, and beds tend to remain in a continuously patchy state (SAFMC A14 2016). Whereas in low energy embayments and areas protected from large fetch, contiguous perennial beds will tend to form.

The SAFMC identifies seagrass habitat as EFH HAPC for the Red Drum FMP as well as several species from the Snapper-Grouper FMP, including adult white grunt (*Haemulon plumieri*); juvenile and adult gray snapper (*Lutjanus griseus*) and lane snapper (*Lutjanus synagris*); juvenile mutton snapper (*Lutjanus analis*), schoolmaster (*Lutjanus apodus*), and dog snapper (*Lutjanus jocu*); and goliath grouper (*Epinephilus itijara*).

The seagrasses observed within the survey area for the Venetian Causeway PD&E, paddle grass and shoal grass, provide EFH for both federally managed fisheries. In addition, these seagrasses may serve as foraging habitat for sea turtles and manatees as well as provide shelter for post-larval and juvenile managed fish and shrimp species. However, the amount of EFH provided by the seagrass (estuarine and marine SAV) within the study area is marginal as less than 1% of the study area contained seagrasses and these grasses tended to be patchy, with sparse to fair coverage where observed. In addition, these

seagrasses were primarily documented around 55-60 feet away from the project bridges and none were observed within 40 feet of any bridge.

6.3.2 Shrimp Fishery Management Plan

The shrimp within this FMP include brown (*Penaeus aztecus*), white (*Penaeus setiferus*), and pink (*Penaeus duorarum*) shrimp. Pink shrimp range from lower Chesapeake Bay to southern Florida, through the Gulf of Mexico to Cape Catoche and the Isla Mujeres at the tip of the Yucatan Peninsula. Maximum densities occur along the coasts of Florida and the Yucatan, in the Gulf of Mexico. Early life stages of pink shrimp are marine (saltwater) and immature pink shrimp typically occupy shallow and estuarine areas. Research has found that the ideal habitats for these shrimp have daily tidal flushing with marine water and large seagrass beds with high blade densities (Costello et al. 1986). Pink shrimp are common in the estuaries and shallow marine waters surrounding southern Florida and into deep waters southeast of the Keys, and are the dominant species within the Dry Tortugas shrimping grounds and Florida Bay (Solomon 1968). Pink shrimp have been known to spawn in waters between 12 and 52 feet deep and off the eastern coast of Florida, peak spawning activity appears to happen during the summer months. Brown shrimp typically range from Martha's Vineyard, Massachusetts south to the Florida Keys and is known to inhabit waters as deep as 350 feet, but are much more frequently found in water less than 180 feet deep. Although the spawning season for brown shrimp has not fully been determined, they are known to spawn in relatively deep waters (greater than 45 feet) and the larvae typically arrive back in estuarine waters in February and March (SAFMC 1998). White shrimp range from Fire Island, New York to St. Lucie Inlet on the Atlantic Coast of Florida and are not typically found within the study area in Biscayne Bay (SAFMC 1998).

EFH for shrimp, includes inshore estuarine nursery areas, offshore marine habitats used for spawning and growth to maturity, and all interconnecting water bodies as described in the SAFMC Habitat Plan. Inshore nursery areas include tidal freshwater (palustrine), estuarine, and marine emergent wetlands (e.g., intertidal marshes); tidal palustrine forested areas; mangroves; tidal freshwater, estuarine, and marine submerged aquatic vegetation (e.g., seagrass); and subtidal and intertidal non-vegetated flats. Areas which meet the criteria for EFH-HAPCs for penaeid shrimp include all coastal inlets, all state-designated nursery habitats of particular importance to shrimp, and state-identified overwintering areas. The seagrasses observed within the survey area for the Venetian bridges, paddle grass and shoal grass, provide EFH for this federally managed fishery. However, the amount of EFH provided by the seagrass (estuarine and marine SAV) within the study area was marginal as less than 1% of the study area contained seagrasses and these grasses tended to be patchy, with sparse to fair coverage where observed. In addition, these seagrasses were primarily documented around 55-60 feet away from the project bridges.

6.3.3 Snapper-Grouper Fishery Management Plan

SAFMC's EFH designation for snapper-grouper species applies to all waters from the United States Exclusive Economic Zone (EEZ) to the landward most influence of the tide, from the Virginia/North Carolina border to the Dry Tortugas in the Florida Keys (See **Figure 6-1** for the SAFMC Management Boundary Line). Several representative species from the Snapper-Grouper fishery known to occur within the project area in Biscayne Bay include gray snapper, mutton snapper, white grunt and hogfish (*Lachnolaimus maximus*). Biscayne Bay provides vital nursery habitat for many coastal bay and coral-reef fishes and both young fish and adults utilize the shoreline habitats in the Bay for forage and protection.

These important species use Biscayne Bay and its inshore habitats as nursery and juvenile forage areas before migrating offshore to the coral reefs (Ault et al. 2001).

EFH for snapper-grouper fishery includes coral reefs, live/hardbottom substrate, SAV, artificial reefs and medium to high profile outcroppings on and around the shelf break zone from shore to at least 600 feet (but to at least 2000 feet for wreckfish) where the annual water temperature range is sufficiently warm to maintain adult populations of members of this largely tropical complex. EFH includes the spawning area in the water column above the adult habitat and the additional pelagic environment, including Sargassum, required for larval survival and growth up to and including settlement. In addition, the Gulf Stream is an EFH because it provides a mechanism to disperse snapper grouper larvae. For specific life stages of estuarine dependent and nearshore snapper-grouper species, EFH includes areas inshore of the 100-foot contour, such as attached macroalgae; submerged rooted vascular plants (seagrasses); estuarine emergent vegetated wetlands (saltmarshes, brackish marsh); tidal creeks; estuarine scrub/shrub (mangrove fringe); oyster reefs and shell banks; unconsolidated bottom (soft sediments); artificial reefs; and coral reefs and live/hard bottom (SAFMC 2016).

Areas which meet the criteria for EFH-HAPCs for species in the snapper-grouper management unit include medium to high profile offshore hard bottoms where spawning normally occurs; localities of known or likely periodic spawning aggregations; nearshore hard bottom areas; mangrove habitat; seagrass habitat; oyster/shell habitat; all coastal inlets; all state-designated nursery habitats of particular importance to snapper grouper; pelagic and benthic Sargassum; Hoyt Hills for wreckfish; the Oculina Bank Habitat Area of Particular Concern; all hermatypic coral habitats and reefs; manganese outcroppings on the Blake Plateau; and Council-designated Artificial Reef Special Management Zones (SMZs).

The estuarine and marine SAV (the seagrasses), live/hardbottom, and unconsolidated bottom substrate observed within the survey area for the Venetian bridges provide EFH for this federally managed fishery. The estuarine and marine SAV (seagrass) is considered a HAPC for this FMP; however, the seagrass habitat was marginal, covering less than 1% of the study area and these seagrasses tended to be patchy, with sparse to fair coverage where observed. In addition, the seagrasses were primarily documented around 55-60 feet away from the project bridges.

6.3.4 Corals, Coral Reefs & Live/Hardbottom Fishery Management Plan

EFH for hermatypic (reef building) stony corals includes rough, hard, exposed, stable substrate from Palm Beach County south through the Florida reef tract in subtidal to 100 feet depth, subtropical (15°-35° C), oligotrophic waters with high salinity (30 to 35 parts per thousand) and turbidity levels sufficiently low enough to provide algal symbionts adequate sunlight penetration for photosynthesis (SAFMC 2017). Ahermatypic stony corals are not light restricted and their EFH includes defined hard substrate in subtidal to outer shelf depths throughout the management area.

Areas which meet the criteria for EFH-HAPCs for coral, coral reefs, and live/hard bottom include the *Phragmatopoma* (worm reefs) reefs off the central east coast of Florida; Oculina Banks off the east coast of Florida from Ft. Pierce to Cape Canaveral; nearshore (0-4 meters; 0-12 feet) hard bottom off the east coast of Florida from Cape Canaveral to Broward County); offshore (5-30 meter; 15-90 feet) hard bottom off the east coast of Florida from Palm Beach County to Fowey Rocks; Biscayne Bay, Florida; Biscayne National Park, Florida; and the Florida Keys National Marine Sanctuary (SAFMC 2004).

The rough, hard, exposed, stable substrate in subtidal to outer shelf depths, subtropical, within a wide range of salinity and turbidity levels sufficiently low enough to provide algal symbionts adequate sunlight penetration for photosynthesis (referred to as the “rough, hard, exposed, stable substrate” throughout the remainder of the document) observed within Community No. 1 in the survey area for the Venetian bridges provides EFH for this federally managed fishery. The bridge pilings and rip-rap/rubble/hard debris areas documented within Community No. 1 provide EFH for corals (i.e. the rough, the hard, exposed, stable substrate etc.). The corals found within this community were found primarily on the rip-rap/hardbottom debris and were typically small, isolated lesser starlet corals. There were no hard corals documented on any bridge structure (aka pilings, fenders or end bents) throughout the survey area. Other coral species included: ivory brush coral, rose coral, and grooved brain coral, knobby star coral, blushing star coral and round starlet coral. These corals occurred much less frequently and the majority of the corals in this community were less than 10 cm. Only a few isolated corals measuring greater than 10 cm were observed in this community and were mainly found around the areas where the rip-rap begins to elbow out away from the bridge at the eastern/western limits of the survey areas towards the rip-rap shorelines between bridges. It should be noted that none of the observed species of coral are listed as threatened or endangered by NOAA NMFS.

6.3.5 Spiny Lobster Fishery Management Plan

The spiny lobster is found in coastal and shallow continental shelf waters along the western Atlantic coast from North Carolina to Brazil, including Bermuda, and throughout the Gulf of Mexico. The species is particularly abundant off the southern Florida coast from Florida Bay to Dry Tortugas. In Florida, the mating season is primarily from February to April, but some occurs year-round (GM and SA FMCs, 1982). In the Florida Keys area, spawning peaks in May-June. Spawning occurs offshore in open Gulf waters and tends to occur on coral reefs. Spiny lobster typically utilize the crevices and relief provided by benthic features such as sponges, corals and seagrasses.

EFH for spiny lobster includes nearshore shelf/oceanic waters; shallow subtidal bottom; seagrass habitat; unconsolidated bottom (soft sediments); coral and live/hard bottom habitat; sponges; algal communities (*Laurencia*); and mangrove habitat (prop roots). In addition, the Gulf Stream is an EFH because it provides a mechanism to disperse spiny lobster larvae. Areas which meet the criteria for EFH-HAPCs for spiny lobster include Florida Bay, Biscayne Bay, Card Sound, and coral/hard bottom habitat from Jupiter Inlet, Florida through the Dry Tortugas, Florida. Six (6) of the seven (7) of the EFH types observed within the Venetian Causeway survey area (Estuarine & Marine SAV, Unconsolidated Bottom, Live/Hardbottom, Shallow Subtidal bottom, Sponges, and Algal Communities) provide EFH for this federally managed fishery. Biscayne Bay along with the live/hardbottom community are considered HAPCs for this FMP.

6.3.6 Red Drum Fishery Management Plan

Red Drum are found from Massachusetts to northern Mexico including south Florida and throughout the Gulf of Mexico (Robbins et al. 1986). This species of game fish is common on the west coast of Florida (Springer and Woodburn 1960; Yokel 1966) and Indian River Lagoon, and found throughout Florida waters. Depending on life stage, they are found from estuarine to offshore waters and occur over a variety of habitat types including submerged aquatic vegetation, soft bottom, hard bottom, emergent marsh, sand/shell, and early life stages are water column associated. Normally associated with such seagrasses

Halodule wrightii, *Halodule beaudettes*, *Ruppia maritima*, and *Thalassia testudinum*. Adults are commonly found over muddy, sandy, or oyster reef bottoms with little or no sea grass. Red drum tend to utilize the inshore seagrass beds, oyster flats, structure such as docks and pilings, and the deeper channels within Biscayne Bay and are most prevalent during the warmest and coolest months of the year.

EFH for this federally managed fishery includes the following habitats to a depth of 160 feet offshore: tidal freshwater; estuarine emergent vegetated wetlands (flooded saltmarshes, brackish marsh, tidal creeks); estuarine scrub/shrub (mangrove fringe); submerged rooted vascular plants (sea grasses); oyster reefs and shell banks; unconsolidated bottom (soft sediments); ocean high salinity surf zones; and artificial reefs. The area covered includes Virginia through the Florida Keys. Areas which meet the criteria EFH-HAPCs for red drum include all coastal inlets, all state-designated nursery habitats of particular importance to red drum; documented sites of spawning aggregations in North Carolina, South Carolina, Georgia, and Florida described in the Habitat Plan; other spawning areas identified in the future; and habitats identified for submerged aquatic vegetation (i.e. Biscayne Bay).

6.4 Evaluation of Impacts on Essential Fish Habitat

6.4.1 Direct Impacts on Essential Fish Habitat

The Venetian Causeway project area is located in a previously disturbed area that makes up well less than 1% of Biscayne Bay (around 5-6 acres out of the 64,607 acres of BBAP). Minor direct impacts to the benthic habitat are anticipated from project related construction on underwater bridge structures. This area anticipated to be directly impacted is mainly limited to Community No. 1 (as described in Section 6.2.1). This Community is directly adjacent to the bridge edges and structures and has the potential to be impacted by any piling work (rehabilitation or replacement) or bridge widening. Direct impacts to this Community would likely be to the sponge, octocoral and tunicate communities located on and adjacent to the bridge pilings and directly underneath the bridge edges. The potential impacts to any protected marine resources in Community No. 1 is minimal as very few hard (*Scleractinia*) corals were observed and the corals that were documented in this Community were primarily located on rip-rap and debris (not on bridge structures). If determined necessary, these corals could be relocated prior to project construction. Direct impacts to Community No. 2 are not anticipated as this Community is likely to be outside the project's impact footprint. There are no anticipated potential impacts to protected marine resources in Community No. 2 as no hard corals or any other protected, threatened or endangered marine resources were observed utilizing this Community. Community No. 3 consisted of isolated patches seagrass, mainly paddle grass and one instance of shoal grass, and the threatened Johnson's seagrass was not observed. This Community is not anticipated to be impacted as none these seagrass patches were within 40 feet of any existing bridge. These seagrass patches are annually, and even seasonally, variable in density and location; hence, further evaluation of potential impacts will need to be examined when information about barge spudding locations and travel routes become available.

Regardless of the design alternative, no direct impacts are anticipated from this project to the Estuarine and Marine SAV EFH (seagrass patches), based on the distance of these resources from the project bridges. Furthermore, all observed seagrass within the study area was noted at depths of at least 7 feet which makes these areas unlikely to be impacted by project barges (indirect impacts). Therefore, the project is anticipated to have no adverse impacts on this EFH HAPC. As there are no adverse impacts to

Estuarine and Marine SAV anticipated from this proposed project, no adverse impacts to the Red Drum FMP are anticipated.

Based on the minor impacts that are anticipated to Community No. 1, the following EFH types have the potential to be directly impacted by project construction: 1. the rough, hard, exposed, stable substrate, 2. the Live/hardbottom, 3. the unconsolidated bottom, 4. the sponge community, and 5. the algal community. Impacts to these EFH types could impact species from the following FMPs: 1. the shrimp, 2. the snapper-grouper, 3. the spiny lobster and 4. the corals. With the few corals in the project area being proposed for relocation prior to construction, no direct impacts are anticipated to any species within the Coral FMP.

Construction related impacts are anticipated to the sponge, octocoral, and tunicate community on/adjacent to the bridge structures as impacts to bridge pilings and potential bridge widening have been proposed. However, it is anticipated that this community would naturally re-establish post construction as (even in the worst-case impact scenario of full bridge replacement) the bridge piling habitat that is currently utilized by this community would be replaced by the same (new) bridge piling habitat. Although proposed bridge widening may add minor shading impacts (indirect impact) to this sponge, octocoral, and tunicate, the widening is not very substantial, and this existing sponge dominated community is established in the shaded areas under the bridge where the bridge pilings currently exist and would be expected to re-establish on any new pilings post-construction.

Bridge widening may displace and therefore have minor impacts to the Algal community, Live/hardbottom, Rough, hard, exposed, stable substrate and Unconsolidated bottom. However, only small amounts of these habitats would be displaced and all these EFH types would be expected to persist and/or re-establish post-construction; therefore, the widening impacts are not substantial enough to have an adverse impact on any of these EFH types. Hence, the Live/hardbottom HAPC is not anticipated to be permanently adversely impacted. Temporary displacements of the shrimp, spiny lobster, and species within the snapper-grouper FMP may occur during project construction; however, again, all the species within these FMPs would be expected to return post-construction as the existing EFH types they currently utilize are anticipated to re-establish. Therefore, regardless of the direct impacts to any of the EFH within the project area, no adverse impacts are anticipated to the any species within the Shrimp, Spiny Lobster or Snapper-Grouper FMPs.

In summation, adverse impacts to EFH from this proposed project are anticipated to be minimal as the impacts from this project are expected to be only temporary displacements with no substantial loss or degradation of any EFH or EFH HAPC. Furthermore, no species within any of the FMPs regulated by the SAFMC are anticipated to be adversely impacted. Due to the small size of the project and the minor, temporary nature of the anticipated impacts, no long-term adverse impacts are anticipated for the geographically designated marine HAPC, Biscayne Bay.

Table 6-3 Additional Benthic Impacts Associated with Alternatives

Bridge Identifier	Bridge length	Existing Bridge Width	Recommended Alternative Bridge Width	Alternative 7 – Arched Beams		Alternative M4 - Double Leaf Bascule	
				Impacts (square feet)	Impacts (acres)	Impacts (square feet)	Impacts (acres)
1 (west bascule 874459)	2,005	41.833	Reconstructed	--	--	NA	NA
2 (fixed 874460)	200	41.833	57.833	3200	0.07	--	--
3 (fixed 874461)	160	41.833	57.833	2560	0.06	--	--
4 (fixed 874463)	160	41.833	57.833	2560	0.06	--	--
5 (fixed 874465)	160	41.833	57.833	2560	0.06	--	--
6 (fixed 874466)	160	41.833	57.833	2560	0.06	--	--
7 (fixed 874471)	160	41.833	57.833	2560	0.06	--	--
8 (fixed 874472)	160	41.833	57.833	2560	0.06	--	--
9 (fixed 874473)	154.5	41.833	57.833	2472	0.06	--	--
10 (east bascule 874474)	302	41.833	57.833	--	--	4,832	0.11
11 (fixed 874477)	154.5	41.833	57.833	2472	0.06	--	--
12 (fixed 874481)	460	41.833	57.833	7360	0.17	--	--
Total Impacts per Alternative (7 and M4)				30,864	0.71	4,832	0.11
Total Impacts for Recommended Alternatives				35,696 square feet	0.82 acres		

6.4.2 Indirect Effects on Essential Fish Habitat

Indirect environmental effects associated with the replacement of the Venetian Causeway are likely to be minimal. The new construction will follow the same alignment as the existing Causeway, and vehicle capacity will not be increased. Therefore, the proposed action itself is not expected to promote new development, decrease water quality, nor encourage changes in existing or future land uses. Dominant land uses surrounding the project area consist of residential and commercial, and public and semi-public, which is not anticipated to change post-construction.

6.4.3 Cumulative Effects on Essential Fish Habitat

The project area is located within the Cities of Miami and Miami Beach, which are developed and virtually built-out with little to no remaining vacant land. Ongoing and future development is likely to be in the form of reconstruction or redevelopment of existing facilities. Planned improvements are to be constructed within existing right of way and include improvements to the stormwater management system. Therefore, it is anticipated that cumulative impacts to EFH from the proposed action, when combined with other past, present, and future projects, would be minimal.

6.4.4 Temporary / Construction Impacts on Essential Fish Habitat

Any project construction with potential to impact the benthic habitat between the months of February through April (spiny lobster mating season within BBAP) may displace individual lobsters at the bridge actively under construction. Although temporary displacements of individual lobsters are anticipated, the sequential bridge construction methodology that is anticipated for this project would limit these displacements to only the bridge actively being constructed/demolished. This sequential methodology will minimize impacts as these minor, temporary displacements would not be expected to interrupt the mating behaviors of this species. Further coordination with the regulatory agencies on construction methodology is anticipated to occur during the design and permitting phase of the project.

While there are no direct impacts to seagrasses anticipated from this project, if barge spudding is anticipated, the spudding will occur close to the bridge to avoid unnecessary impacts to the seagrasses in the project area. As BBAP is an OFW, proper and stringent turbidity control measures will be established and maintained so as to minimize all construction related turbidity and sedimentation impacts (indirect impacts). With the appropriate turbidity control measures in place and with proper barge routes and spudding areas determined, no indirect impacts are anticipated from this project.

Temporary impacts to live/hardbottom habitat and sponges on or adjacent to the bridge piles associated with the use of barges such as spudding (anchoring) to hold construction cranes and equipment may also occur. However, FDOT will utilize BMP's to minimize resource impacts during construction. It is also expected that fishery resources would avoid construction areas resulting in a temporary displacement. These impacts would be temporary in nature as these fishery resources would likely return post construction.

Corals were not observed on the bridge substructure during benthic surveys conducted in August 2014 and July 2017. Corals were observed encrusting the rip-rap areas around the undeveloped spoil islands between the main islands of the causeway: Spoil Island 1 between San Marco and San Marino Islands, Spoil island 2 between San Marino and Di Lido Islands, Spoil Island 3 between Di Lido and Rivo Alto Islands, and Spoil Islands 4 and 5 between Rivo Alto and Belle Islands. However, these corals are not listed species. These areas may be impacted during construction, as widening (14 feet on the south side and 12 feet on the north side) may require involvement with areas of the rip rap zone that are currently inhabited by corals.

Controlling temporary construction impacts, such as degradation of water quality by stormwater runoff or filling wetlands due to erosion of upland areas into wetland areas, is usually accomplished through implementation of standard BMPs. Proper implementation and maintenance of BMPs can avoid or

minimize unnecessary temporary or permanent impacts to seagrass or other benthic communities during construction. Staging areas for the Contractor will be identified and maintained in accordance with FDOT *Standard Specifications for Road and Bridge Construction*.

Any staging areas on site or near the Bay that will contain paints, adhesives, fuels, solvents, lubricating oils, etc. to be used during construction shall have controlled access. Construction and staging areas will also have appropriate stormwater and erosion control measures in place per the National Pollutant Discharge Elimination System (NPDES) Permit required Erosion Control Plan (ECP)/Stormwater Pollution Prevention Plan (SWPPP). Water quality impacts to the Biscayne Bay will also be minimized by adherence to the ECP/SWPPP for ground disturbing construction activities. The project will be constructed in compliance with applicable permit special conditions for use of such BMPs as turbidity curtains in the water in a manner that will not physically interfere with or damage the EFH resources or wetlands. Overall, the projects impact on EFH is determined to be “minimal”.

7.0 AVOIDANCE, MINIMIZATION & CONCEPTUAL MITIGATION

Permanent shading of surface waters appears unavoidable as no other reasonable location could be used to accomplish the project's goals and satisfy the purpose and need of the project. Temporary impacts to wetlands and OSWs can be avoided by employing specific construction methods such as constructing the bridge from the land where feasible. Constructing the project from land would eliminate additional impacts to benthic communities associated with construction barges and work boats (temporary shading, turbidity from propeller churning, bottom scouring from spuds or anchors, and accidental spills).

There are several avoidance and minimization measures that will help ensure no adverse impacts to EFH occur from this project. Although infrequently documented and not observed on any bridge structures, if any corals are anticipated to be impacted, they can be relocated prior to construction to avoid any impacts to coral resources. Relocation of barrel sponges has also been shown to be viable (Gilliam et al. 2008). As impacts to sponges are anticipated, these impacts could be minimized by relocating the barrel sponges prior to construction.

Unavoidable impacts will be mitigated based upon continued coordination with permitting agencies during the Design/Permitting phase of the project. If impacts are anticipated during design, a conceptual mitigation plan will be developed, and these impacts will be quantified via benthic survey. Corals in the area of potential impact will be inventoried and those suitable will be relocated per NMFS methodology prior to construction. Consideration will also be given to the feasibility of relocating large barrel sponges that may be impacted.

Protection of West Indian manatees, swimming sea turtles and small tooth sawfish during all phases of bridge construction may be accomplished through the implementation of *Standard Manatee Conditions for In-Water Work*, and *Sea Turtle and Smalltooth Sawfish Construction Conditions*. These conditions are both included in the appendix (**Appendices C and G**, respectively). If any of the free-swimming species are found within the project area during construction, the animal would be given the space and time required to leave the area per State and Federal regulations.

In addition, Miami-Dade County may accept clean concrete and steel material for its artificial reef program. During the emergency reconstruction of Bridge No. 1, the clean bridge material was placed in a permitted artificial reef in accordance with the Miami-Dade County Department of Regulatory and Economic Resources (RER) Class I Coastal Construction Permit. FDOT and the County will coordinate with DRER during the design and permitting phase to determine if the material from the bridges can be accepted at an artificial reef placement site during future construction.

8.0 ANTICIPATED PERMITS

Below is a list of the anticipated permits required:

- USCG Bridge Permit
- USACE Section 404 Permit
- SFWMD Environmental Resource Permit
- Miami-Dade County DRER Class I Coastal Construction Permit
- Miami-Dade County DRER Class II Drainage Permit

9.0 CONCLUSIONS

As designed, the proposed action cannot completely avoid impacts to EFH since no other reasonable location could be used to accomplish the project's goals and satisfy the purpose and need of the project. Impacts, however, have been minimized through the selection of a bridge alternative that utilizes current spoil islands and will not require the infill of EFH. Additional measures related to construction method, equipment used, and implementation of standard BMPs also serve to minimize unnecessary impacts to benthic communities during construction. Permanent shading of approximately 0.82 acres or 35,696 square feet is unavoidable. However, the area represents a minimal loss of habitat for managed species compared to similar habitat within the Biscayne Bay and nearby Collins Canal. Mitigation for the shading of these unvegetated open water areas is typically not required by environmental agencies.

Although EFH resources occur within the area of construction, the potential impacts to fisheries will be "minimal". The sand/shell bottom would be shaded from the barge during construction, but it is temporary, and the proposed bridges will be in the same footprints as the existing locations. The hard bottom and coral communities will have no impacts incurred as there are no corals growing on the bridge structures to be repaired or replaced. Sponges and soft corals may potentially be impacted by repair or replacement of bridge structures but will repopulate very quickly post construction. Unavoidable impacts would be mitigated based upon continued coordination with NMFS and other regulatory agencies during the design/permitting phase of the project if required. As discussed in Section 7, any impacts to sponges could be minimized by relocating the barrel sponges prior to construction.

EFH avoidance and minimization efforts include pollution prevention measures such as turbidity barriers that extend from the water's surface to the bay bottom to contain any turbidity created during construction; and monitoring of the turbidity levels with ceasing of work if they are above standards.

Based upon project design, construction methods to minimize impacts, implementation of BMP and appropriate mitigation, the minimal impacts associated with the project will not adversely affect EFH or federally-managed fish species listed in this report. As stated in the ETDM Programming Summary Report for this project, all necessary measures will be taken to avoid or minimize impacts to wetlands or other jurisdictional areas to the greatest extent practicable during project design. A mitigation plan will be prepared if required. In addition, all applicable permits will be obtained in accordance with Federal, State, and Local laws and regulations.

Based upon project design, construction methods to minimize impacts, implementation of protection measures for smalltooth sawfish, manatees, and sea turtles, BMP and appropriate mitigation, the proposed project will have "**no effect**" on the Federally-listed wood stork and piping plover and State-listed species; and "**may affect, not likely to adversely affect**" Federally-listed species or designated critical habitat including; the West Indian manatee, American crocodile, smalltooth sawfish, Johnson's seagrass, Johnson's seagrass critical habitat, green sea turtle, leatherback sea turtle, hawksbill sea turtle, loggerhead sea turtle, Kemp's Ridley sea turtle and staghorn/elkhorn coral (See Section 4.0). Upon completion of the proposed action, the Biscayne Bay will continue to provide shelter, foraging and nursery areas for listed and managed species. The proposed improvements would not directly or indirectly affect critical habitats. The project will not cause unacceptable cumulative impacts to listed species or critical habitats. Likewise, the project is not anticipated to change existing or future land use or the character of the project area; therefore, no indirect impacts are anticipated.

The following are implementation measures to minimize impacts during construction:

- During final design, a benthic survey will be conducted to inventory all corals in the area of potential impact. The survey will identify which corals are suitable for relocation prior to construction. A coral relocation plan will be developed and coordinated with the environmental permitting agencies during the permitting process.
- The final design benthic survey will assess the suitability for relocation of the existing barrel sponges in the area of potential impact.
- Barge spudding will occur in close proximity to the bridges during construction to avoid unnecessary impacts to seagrasses.
- No blasting or any explosives will be used in the removal of any bridge structures.
- The latest versions of the FWC *Standard Manatee Conditions for In-Water Work*, and NMFS *Sea Turtle and Smalltooth Sawfish Construction Conditions* will be implemented for the protection of West Indian manatees, swimming sea turtles and smalltooth sawfish during all phases of bridge construction.

10.0 REFERENCES

Florida Department of Transportation. June 2017. *Project Development and Environment Manual, Part 2, Chapter 17, Essential Fish Habitat*.

Florida Department of Transportation. *Efficient Transportation Decision Making Environmental Screening Tool*, ETDM Summary No. 12756, Published February 14, 2012.

Florida Department of Environmental Protection. 2017. Biscayne Bay Aquatic Preserves (<http://dep.state.fl.us/coastal/sites/biscayne/>). FDEP, 3900 Commonwealth Boulevard M.S. 235 Tallahassee, Florida 32399

NOAA NMFS Southeast Region. Habitat Conservation Division. A Science-based Seagrass Survey Window for Coastal Construction Project Planning in Florida. By Jocelyn Karazsia. West Palm Beach: n.p., 2010. Print.

SAFMC (South Atlantic Fishery Management Council). 1998. Habitat Plan For The South Atlantic Region: Essential Fish Habitat Requirements For Fishery Management Plans of The South Atlantic Fishery Management Council. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407-4699.

Gilliam, David S.; Walker, Brian K.; Saelens, S. J.; Fahy, Daniel P.; and Kosmynin, Vladimir N., "Recovery of Injured Giant Barrel Sponges, *Xestospongia muta*, Offshore Southeast Florida" (2008). Oceanography Faculty Proceedings, Presentations, Speeches, Lectures. 55. http://nsuworks.nova.edu/occ_facpresentations/55

Red drum

1990-06-01, Thomas Czapl, NOAA/NOS-SEA, Silver Spring, Maryland 1993-05-25, T Phillips, Mote Marine Laboratory

778

Robins, C. Richard, G. Carlton Ray, John Douglass and R. Freud. 1986. A Field Guide to Atlantic Coast Fishes of North America Peterson Field Guide Series No. 32, Houghton Mifflin Co., Boston. 354p.

664

Springer, V.G. and K.D. Woodburn. 1960. An ecological study of the fishes of the Tampa Bay area. Fla. St. Bd. Conser. Prof. Pap. Ser. No. 1: 104.

784

Yokel, B.J., 1966. A contribution to the biology and distribution of the red drum, *Sciaenops ocellata*. MS thesis, Univ. Miami: 161.

Spiny lobster

1991-07-18, Thomas Czaplá, NOAA/NOS-SEA, Silver Spring, Maryland

811

Gulf of Mexico and South Atlantic Fishery Management Councils (GMFMC). 1982. Fishery management plan environmental impact statement and regulatory impact review for spiny lobster in the Gulf of Mexico and south Atlantic Gulf of Mexico Fishery Management Council, Tampa, Florida and South Atlantic Fishery Management Council, Charleston, South Carolina.

Coral

ESSENTIAL FISH HABITAT—HABITAT AREAS OF PARTICULAR CONCERN (EFH-HAPC) AND CORAL HABITAT AREAS OF PARTICULAR CONCERN (C-HAPC)

SAFMC (South Atlantic Fishery Management Council). 2004. SAFMC EFH-HAPC and C-HAPC South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407-4699.

SAFMC (South Atlantic Fishery Management Council). 2017. Amendment 43 to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407-4699. 631 pp

SAFMC (South Atlantic Fishery Management Council). 2017. Coral & Live/Hard Bottom Habitat (<http://safmc.net/habitat-and-ecosystems/coral-livehard-bottom-habitat/>). SAFMC, 4055 Faber Place drive, Suite 201. North Charleston, SC 29405

Snapper-grouper

SAFMC (South Atlantic Fishery Management Council). 2016. Users Guide to Essential Fish Habitat Designations by the South Atlantic Fishery Management Council. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407-4699.

SAFMC (South Atlantic Fishery Management Council). 1983. Fishery Management Plan, Regulatory Impact Review, and Final Environmental Impact Statement for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407-4699.

Ault, J.S., S.G. Smith, G.A. Meester, J. Juo, and J.A. Bohnsack. 2001. Site Characterization for Biscayne National Park: Assessment of Fisheries Resources and Habitats. NOAA Technical Memorandum NMFS-SEFSC-468. 156 pp.

Pink shrimp

144

Costello, T.J., D.M. Allen, and J.H. Hudson. 1986. Distribution, seasonal abundance and ecology of juvenile northern pink shrimp, *Penaeus duorarum*, in the Florida Bay area. NOAA Technical Memorandum NMFS-SEFC-161.

H. Saloman, Carl & M. Allen, Donald & J. Costello, Thomas. (1968). Distribution of Three Species of Shrimp (Genus Penaeus) in Waters Contiguous to Southern Florida. Bulletin of Marine Science. 18. 343-350.

SAV

Kenworthy et al. 1982; Kenworthy 2000

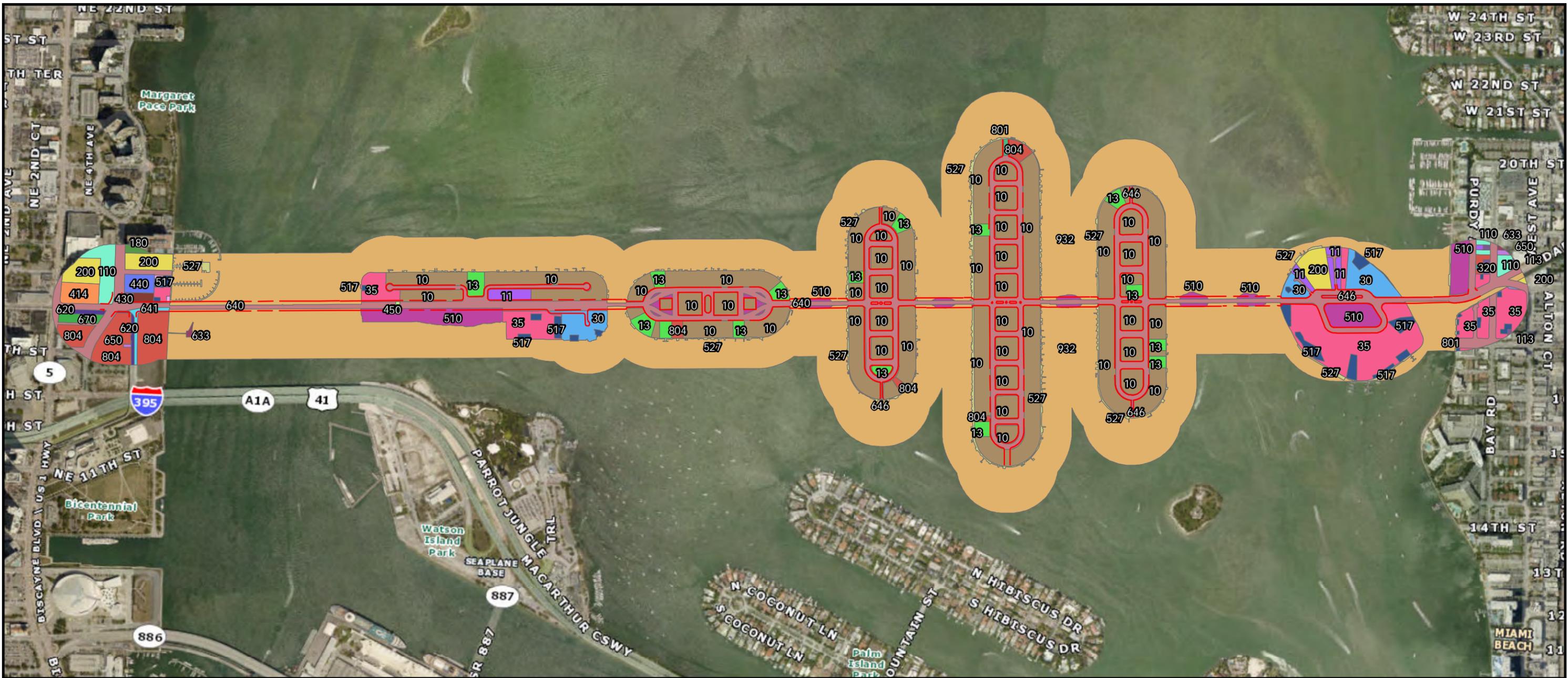
SAFMC (South Atlantic Fishery Management Council). 2016. A14 Habitat Sections. South Atlantic Fishery Management Council, 1 Southpark Cir., Ste 306, Charleston, S.C. 29407-4699.

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&ved=0ahUKEwiR6Obm7_jVAhUS2mMKHTKhAfQQFgg9MAM&url=https%3A%2F%2Fsafmc.net%2Fdownload%2FBriefing%2520Book%2520Habitat%2520May%25202017%2FA14_HabitatSections.pdf&usg=AFQjCNGhbsABq5bPHC9_5nWsf0E0d8ReAg

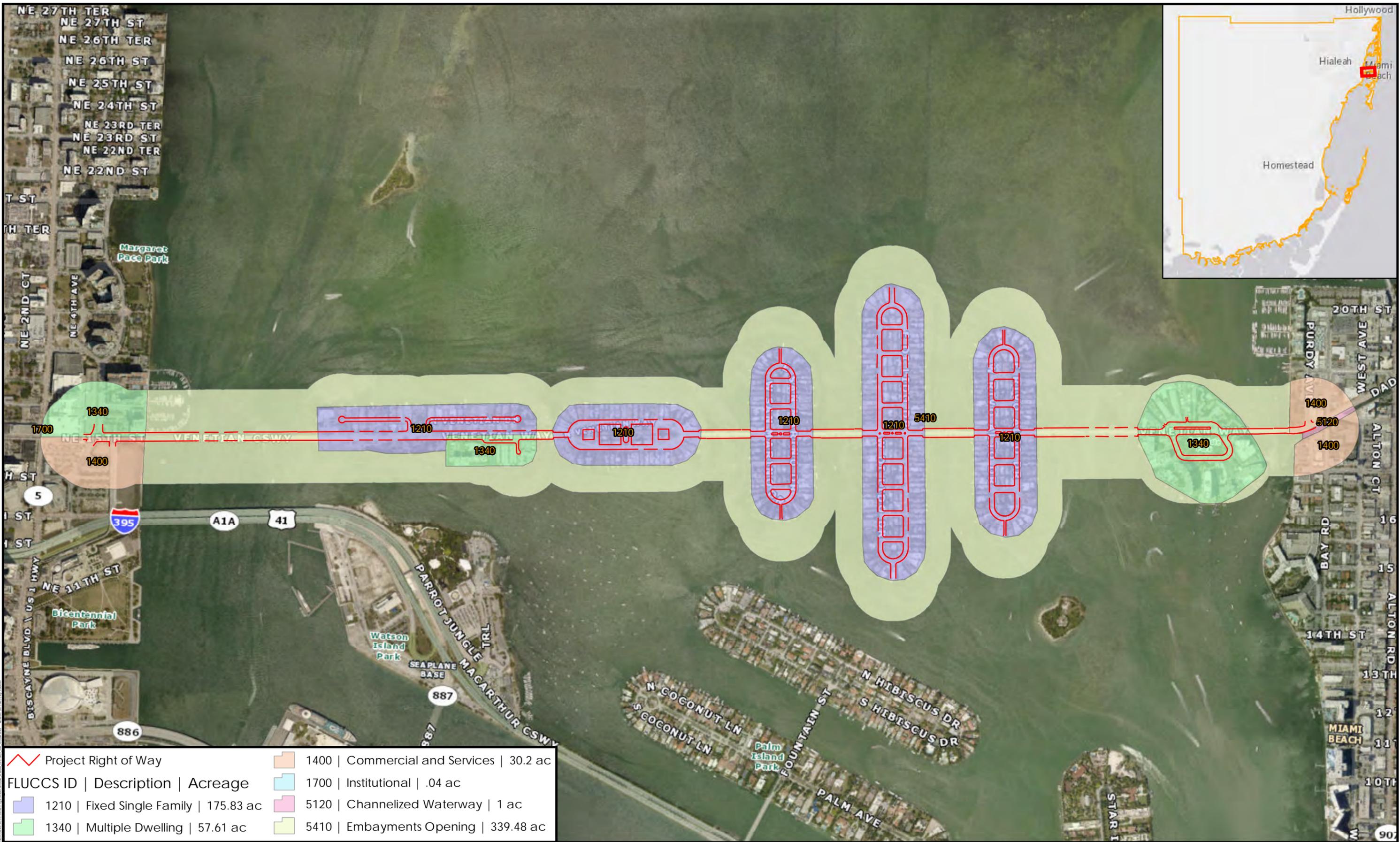
https://safmc.net/download/.../A14_HabitatSections.pdf

Appendix A

LAND USE FIGURES



Land Use ID	Description	Acreage
10	Single-Family, Med.-Density (2-5 DU/Gross Acre)	108.69 ac
11	Single-Family, High Density (Over 5 DU/Gross Acre)	2.89 ac
13	Single-Family, Low-Density (Under 2 DU/Gross Acre)	8.87 ac
30	Multi-Family, Low-Density (Under 25 DU/Gross Acre)	7.11 ac
35	Multi-Family, High Density (Over 25 DU/Gross Acre)	24.66 ac
110	Sales and Services	3.64 ac
113	Office Building	0.67 ac
180	Multi-floor Residential with Commercial Use	0.35 ac
200	Transient Residential	6.48 ac
320	Industrial	0.17 ac
412	Private Schools	0.13 ac
414	Colleges and Universities	1.94 ac
430	Hospitals, Nursing Homes and Adult Congregate Living Quarters	0.51 ac
440	Houses of Worship and Religious	1.37 ac
450	Governmental/Public Administration	6.81 ac
510	Municipal Operated Parks	13.53 ac
517	Private Recreational Facilities	5.15 ac
527	Marina complexes	8.22 ac
620	Railroads - Terminals, Trackage, and Yards.	0.98 ac
633	Communications	0.22 ac
640	Streets and Roads	61.87 ac
641	Paved Highways, Expressways and Ramps	0.88 ac
646	Street Right-of-Way and Entrance Features	0.52 ac
650	Parking - Public and Private Garages and Lots	0.20 ac
670	Road Maintenance and Storage Yards, and Motor Pools	0.92 ac
801	Vacant Government	0.25 ac
804	Vacant, Non-Protected, Privately-Owned	11.21 ac
932	Coastal Water (Bay only) within the Biscayne Bay Urban Aquatic Preserve	332.66 ac



FLUCCS ID	Description	Acreage
1400	Commercial and Services	30.2 ac
1700	Institutional	.04 ac
1210	Fixed Single Family	175.83 ac
1340	Multiple Dwelling	57.61 ac
5120	Channelized Waterway	1 ac
5410	Embayments Opening	339.48 ac



Notes:
 1. Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901 Feet
 2. Source data: FDEP / FDOI
 3. Imagery: Miami-Dade County GIS

Venetian Causeway
 SFWMD FLUCCS Map
 August 2017

Florida Department of Transportation
 1000 N.W. 111th Ave.
 Miami, FL 33172



Appendix B

SITE PHOTOGRAPHS



Photo 1 – Pedestrian Wetlands Survey: Biscayne Island Mangrove Wetland



Figure 2 – Pedestrian Wetlands Survey: Biscayne Island Mangrove Wetland



Figure 3 – Pedestrian Wetlands Survey: Underdeveloped Spoil Island Mangroves and Buttonwoods Growing in the Intertidal Zone

Appendix C

STANDARD MANATEE CONDITIONS FOR IN-WATER WORK/
DRAFT GUIDELINES FOR THE PROTECTION OF MANATEES AND SEA TURTLES
DURING THE USE OF EXPLOSIVES IN THE WATERS OF THE STATE OF FLORIDA

STANDARD MANATEE CONDITIONS FOR IN-WATER WORK

2011

The permittee shall comply with the following conditions intended to protect manatees from direct project effects:

- a. All personnel associated with the project shall be instructed about the presence of manatees and manatee speed zones, and the need to avoid collisions with and injury to manatees. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act, the Endangered Species Act, and the Florida Manatee Sanctuary Act.
- b. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.
- c. Siltation or turbidity barriers shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement.
- d. All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shutdown if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.
- e. Any collision with or injury to a manatee shall be reported immediately to the Florida Fish and Wildlife Conservation Commission (FWC) Hotline at 1-888-404-3922. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-731-3336) for north Florida or in Vero Beach (1-772-562-3909) for south Florida, and emailed to FWC at ImperiledSpecies@myFWC.com.
- f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Temporary signs that have already been approved for this use by the FWC must be used. One sign which reads *Caution: Boaters* must be posted. A second sign measuring at least 8½" by 11" explaining the requirements for "Idle Speed/No Wake" and the shut down of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities. These signs can be viewed at http://www.myfwc.com/WILDLIFEHABITATS/manatee_sign_vendors.htm. Questions concerning these signs can be forwarded to the email address listed above.

CAUTION: MANATEE HABITAT

All project vessels

IDLE SPEED / NO WAKE

When a manatee is within 50 feet of work
all in-water activities must

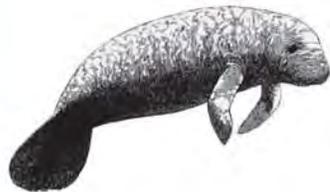
SHUT DOWN

Report any collision with or injury to a manatee:

Wildlife Alert:

1-888-404-FWCC(3922)

cell *FWC or #FWC



DRAFT

**Guidelines for the Protection of Marine
Animals During the Use of Explosives
In the Waters of the State of Florida**

May 2006 DRAFT

PURPOSE

This document is intended to provide guidance for mitigation planning and consultation purposes with state and federal agencies for new projects in the southeast U.S. using explosives. Although there are many other direct and indirect affects associated with the use of activities using explosives that may affect protected species, this guidance focuses on the determination of effects and avoidance of blast effects to protected species and their habitats from underwater explosions.

Killing or harassing threatened and endangered species and destruction or adverse modification of critical habitat is prohibited under the Endangered Species Act (ESA). Similar protection from harm and harassment are offered to all marine mammals under the Marine Mammal Protection Act (MMPA). Although marine plants are listed (i.e., Johnson's seagrass) and marine invertebrates are being considered for listing under the ESA, this guidance document applies to protected species of fishes, sea turtles, marine mammals, and their habitats.

INTRODUCTION

The Endangered Species Act provides Federal protection for the West Indian manatee (*Trichechus manatus*) and six species of sea turtles (green, *Chelonia mydas*; hawksbill, *Eretmochelys imbricata*; Kemp's ridley, *Lepidochelys kempii*; leatherback, *Dermochelys coriacea*; loggerhead, *Caretta caretta*; olive ridley, *Lepidochelys olivacea*). The Marine Mammal Protection Act provides Federal protection for manatees, dolphins and whales. Under State of Florida statutes, the Florida Manatee Sanctuary Act provides protection for the manatee and the Marine Turtle Protection Act provides protection for sea turtles. These Federal and State statutes provide the regulatory authority for required compliance with these guidelines by the blasting proponent (e.g., the person(s) who is(are) proposing works or undertakings that involve the use of explosives). The guidelines provided herein should be for the protection of manatees, whales, mammalian dolphins and sea turtles. These guidelines are intended for in-shore or near-shore projects, and do not specifically address the blasting affects associated with the decommissioning of offshore oil and gas structures in federal waters.

Federally-listed species of fish and critical habitats under the jurisdiction of NOAA Fisheries Service that occur in Florida should also be covered under these guidelines. When blasting is used as a construction/demolition method, the protective measures for marine mammals and sea turtles should also pertain to the following ESA-listed species:

- Gulf sturgeon (*Acipenser oxyrinchus desotoi*)
- Shortnose sturgeon (*Acipenser brevirostrum*)
- Smalltooth sawfish (*Pristis pectinata*)
- Johnson's seagrass

The detonation of explosives in the marine environment has in some instances caused injury and/or death to both marine mammals and sea turtles as reviewed by Ketten (1995), Lewis (1996), and Keevin and Hemen (1997). Individual scientific publications also document the potential for marine mammal (Fitch and Young 1948; Hanson 1954; Reiter 1981; Wright 1971;

Wright 1982) and sea turtle (O’Keeffe and Young 1984; Duronslet et al. 1986; Klima et al. 1988; Gitschlag and Renaud 1989; Gitschlag 1990; Gitschlag and Herczeg 1994) injury and/or death. Based on the best available scientific information describing the potential for marine mammal and sea turtle injury/death, the Florida Fish and Wildlife Conservation Commission (FWC), in cooperation with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS), has prepared these guidelines to provide information to project proponents on the conservation and protection of marine mammals and sea turtles from adverse impacts resulting from the use of confined or open-water explosives in Florida’s waters. Within the context of these guidelines, an explosive is defined as a chemical compound which, when detonated, creates a compressional wave having an almost instantaneous rise time to a very high peak pressure followed by a decay to below ambient pressure by either rapid rapid oxidation or the breaking of high-energy chemical bonds.

APPLICABLE FEDERAL AND STATE LEGISLATION

These guidelines for the protection of marine mammals and sea turtles, the application and review procedures and processes, and reporting requirements that are outlined in this document apply in the context of the State and Federal legislative authorities briefly summarized below.

The Endangered Species Act

Section 9 (16 U.S.C. 1538) - Prohibited Acts

(a) General

- (1)...it is unlawful for any person subject to the jurisdiction of the United States to-
 - (B) take any such species within the United States or the territorial sea of the United States;
 - (C) take any such species upon the high seas;

Section 3 (16 U.S.C. 1532) - Definitions

(18) The term “take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

The Marine Mammal Protection Act

Section 102 (16 U.S.C. 1372) - Prohibitions

(a)...it is unlawful-

(1)(A) for any person or vessel or other conveyance to take any marine mammal in waters or on lands under the jurisdiction of the United States;

Section 3 (16 U.S.C. 1362) - Definitions

(13) The term “take” means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.

(18)(A) The term “harassment” means any act of pursuit, torment, or annoyance which-

- (i) has the potential to injure a marine mammal or marine mammal stock in the wild; or
- (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.

The Florida Manatee Sanctuary Act

Title XXVII, Section 370.12 – Marine animals; regulation

(2) Protection of Manatees or Sea Cows

(d)...it is unlawful for any person at any time, by any means, or in any manner intentionally or negligently to annoy, molest, harass, or disturb or attempt to molest, harass, or disturb any manatee; injure or harm or attempt to injure or harm any manatee; capture or collect or attempt to capture or collect any manatee; pursue, hunt, wound, or kill or attempt to pursue, hunt, wound, or kill any manatee, or possess, literally or constructively, any manatee or any part of any manatee.

The Marine Turtle Protection Act

Title XXVII, Section 370.12 – Marine animals; regulation

(1) Protection of Marine Turtles

(d)(5) Any person, firm, or corporation that illegally takes, disturbs, mutilates, destroys, causes to be destroyed, transfers, sells, offers to sell, molests, or harasses any marine turtle species, or the eggs or nest of any marine turtle species as described in this subsection, commits a third degree felony.

GUIDELINES

In seeking authorization to conduct underwater blasting in the State of Florida, the project proponent is responsible for providing a Blasting Plan. These guidelines are to be used to develop a site-specific Blasting Plan to be submitted to the appropriate State and Federal regulatory agencies (i.e., U.S. Fish and Wildlife Service, National Marine Fisheries Service, U.S. Coast Guard, and U.S. Army Corps of Engineers) as well as the FWC. This site-specific plan is to be submitted during the permitting process and approved before permit issuance. The permit will then reference the plan and the conservation measures within the plan will become permit conditions. Revision of the plan would require a permit modification.

THE BLASTING PLAN

The Blasting Plan must include the following components: (1) Blasting Design, (2) Impact Assessment, (3) Mitigation Plan, and (4) Endangered Species Watch Plan. Each of these components is described in detail below.

1. *Blasting Design*

The project proponent shall provide a “detailed” written description of the project blasting design, which must include a diagram(s) of the blasting design. At a minimum, the following information must be included:

- a. Type of initiation system to be employed. [Is the system fully electric or completely non-electric? Are there parts of both? Is any detonation cord used?]
- b. Timing and duration of underwater blasting, the limitation to daylight shooting, and any tidal and/or seasonal restrictions.

- c. Expected type and weight of explosives to be used per shot for production shots and the maximum charge weight per interval of 25 milliseconds (preferred). Sequentially list every charges' total delay time in increasing time order. Any charge weights with less than 9-milliseconds interval are summed to find the maximum charge weight per delay.

- d. Blast pattern and geometry of the individual shots for a small project or of a general blast production for a large blasting program. Test program to develop from small charges to the maximum charge weight per delay interval necessary for production. The expected production charge weight per delay, spacing and burden between borings, placement of explosives within borings, stemming type and minimum length of stemming placement within the structure (note 3.e. below), and the location of the initiator within the boring. [A small project (e.g., bridge demolition) will have a limited blasting plan, perhaps completely prepared. A large program (e.g., harbor rock removal) will have a general blasting program that varies through the project. A program may be needed to scale the first charge weight per delay to the maximum charge weight per delay for the project.]

- e. Description of millisecond-delays that will be used if multiple charges are required.

- f. Detailed description of the material to be blasted (i.e., substrata characteristics, description of concrete and reinforcement, etc.) and surrounding geology (water depth, water width, sediment thickness, rock or structure being removed, etc.).

- g. Detailed description of control measures that will be employed to assure that hole spacing, burden, hole depth, charge placement, delay interval, the stemming minimum, and recording of the shot have met the conditions of the permit and submitted plan.

2. Impact Assessment

The project proponent shall provide a “detailed” Environmental Impact Assessment of the proposed blasting project. At a minimum, the following information must be included:

- a. The likelihood of sea turtles and marine mammals being in the blasting area. The proponent shall consult existing scientific literature and the FWC and/or other resource agencies. Pre-blast marine mammal/sea turtle surveys may be required, at the discretion of the FWC, USFWS, NMFS, or other reviewing/permitting agencies.

- b. A description of the marine mammal/sea turtle “exclusion zone” that will be developed and used for underwater blasting programs to provide species’ protection. The preferred minimum exclusion zone radius or range from which to protect marine mammal/sea turtles is 500 linear feet beyond the perimeter of placed blasting agents for a shot. The preferred maximum exclusion zone is a 2,000-foot radius beyond the blast perimeter for a submerged shot. An additional 500 feet should be added to the calculated radius or exclusion zone in order to adequately control animals being precluded from this area. When underwater blasting will be conducted in a very controlled manner for a protracted period of months and has acceptable project monitoring, the project proponent may apply to the FWC and other appropriate

permitting agencies for a special review of exclusion zone criteria.

Underwater explosions can be broadly categorized as either “confined” or “open-water.” Confined shots produce much less environmental damage for the same charge weight when compared to open-water shots (Nedwell and Thandavamoorthy 1992; Hempen et al. 2005). For confined shots, the pressure waves are dominantly radiated into a stiff medium (such as rock or a massive structure founded on rock) and remain in that medium. Confined shots have vertical heights of the stiff medium exposed to water (or loose sediment below water) of less than half the smaller areal (horizontal) dimension of removal. [For example, removal of a stiff medium (rock or concrete) exposed to 8 feet of the water and sand vertically for the smaller horizontal removal dimension of 20 linear feet would safely radiate most of its energy into the stiff medium. Alternatively, removal of a concrete column with 8 feet vertically surrounded by water and mud, and a horizontal diameter of less than 16 feet, would be presumed to adversely transmit most of its energy to the water. The former example is a low-impact confined blast, while the latter is an open-water blast that may have high organism impact.] Blasting in the water column, not connected to a structure, has a high transmission of pressure waves through the water column. Blast removal of some stiff-medium structures below the water surface (e.g., columns, piers, or pilings) releases its energy directly to the surrounding water column or loose sediment, which has a high transmission of pressure waves through the water column. Underwater blasting with high transmission to the water column and, thus potentially high organism impact, shall be termed open-water blasting.

The “exclusion zone”, also referred to as the “watch zone” shall be calculated using the following methods, appropriate to the type of blasting:

Open Water Blasting

The exclusion zone for open-water blasting shall be determined from the open-water shot’s maximum charge weight per delay, with an additional buffer of 500 feet. For an open-water shot’s maximum charge weight per delay of less than 0.19 pound, the exclusion-zone radius of 300 linear feet applies. The maximum charge weight per delay of a confined shot shall not exceed 57 pounds for the exclusion-zone criterion beneath the waters of the State of Florida, because the exclusion-zone radius would be greater than 2,000 linear feet. The equation for the open-water blasting exclusion-zone radius, EZ_{OW} , for maximum charge weights per delay between 0.19 to 57 pounds is:

$$EZ_{OW} \text{ (feet)} = (520 w^{1/3})(2) + 500 \text{ feet}$$

Where w is the maximum charge weight (in pounds) per delay of an individual open-water shot.

Confined Blasting

The exclusion zone for confined blasting shall be determined from the confined shot’s maximum charge weight per delay, with an additional buffer of 500 feet. For a confined shot’s maximum charge weight per delay of less than 1.5 pound, the “exclusion zone” radius of 500

linear feet applies. The maximum charge weight per delay of an open-water shot shall not exceed 450 pounds for the exclusion-zone criterion beneath the waters of the State of Florida, because the exclusion zone radius would be greater than 2,000 linear feet. The equation for the confined blasting exclusion zone radius, EZ_C , for maximum charge weights per delay between 1.5 to 450 pounds is:

$$EZ_{OW} \text{ (feet)} = (520 w^{1/3}) + 500 \text{ feet}$$

Where w is the maximum charge weight (in pounds) per delay of an individual confined shot.

c. A record of the type of underwater blasting (open-water or confined), procedures to reduce impacts, calculations of blast parameters, actual placement of explosive agents, organism exclusion zone distance calculations, and plans for observation shall be filed on-site before every shot is fired. Records for each shot of the blasting program shall be retained by the project proponent for the duration of project and made available to the FWC, USFWS, and NMFS immediately onsite or within two business days to the specified mailing address, as requested.

The following records shall be kept for each placement position or boring: (1) - the upper and lower bounds of cemented or consolidated material to be removed or blasted; (2) - the weight of blasting agents and explosives, and their upper and lower bounds; (3) - stemming material appropriate for the size of the borehole; and (4) - upper and lower bounds of the stemming placement within the cemented or consolidated material (usually rock or concrete). The record shall include the sequence of delays from the shortest to longest individual delay time with the total weight of blasting agent at that delay time. The record keeping shall provide enough detail to allow interpretation of the quality of shooting and level of compliance with the Blasting Plan.

d. A description of the monitoring program shall be implemented to record particle velocities when a blasting position is within 1,000 feet of a land-based location. Particle velocity monitoring independently confirms proper shot performance without the cost and difficulty of either pressure-wave recording or organism testing. Reports of particle velocity monitoring should be available to the FWC, USFWS, and NMFS, if requested, on the third business day following the shot.

e. Quantitative evaluation of potential marine mammal/sea turtle (i.e., manatee feeding areas, etc.) habitat that will be destroyed by the blasting project.

3. Mitigation Plan

The project proponent shall prepare a Mitigation Plan that shall include a detailed discussion of the measures employed to avoid or minimize the adverse impacts of blasting. Keevin (1998) provides a general description of mitigation techniques that may be useful to explosives engineers. The following measures shall be included in the Mitigation Plan:

- a. Blasting shall be conducted during the time when manatees, other marine mammals, and sea turtles are least likely to be in the blasting area. Proponents should consult with the FWC, USFWS, and NMFS to determine the appropriate timing.
- b. In tidal areas, the blasting proponent shall conduct blasting during the recommended tidal phase deemed appropriate for the area (i.e., slack or low-tide conditions).
- c. The volume and length of all blasting agents, detonation cord, and explosives will be limited to the minimum necessary to conduct the work in a manner that is efficient, safe for workers, and protective of aquatic and marine organisms. Initiation of explosive charges should be conducted with the minimum length of detonation cord possible or should utilize alternative initiation systems. Detonation cord has its own impact radius (injury/kill zone) along the entire length of submerged detonation cord.
- d. All shock-tubes and detonation cord or electric wires will be recovered and removed after each blast.
- e. After loading a charge in a hole, the hole will be back-filled (stemmed) with angular stemming material. The stemming material shall be uniform, crushed, angular stone. The stemming material shall be within the range of 1/20 to 1/8 of the borehole diameter being confined. The stemming shall not be acceptable if it contains more than 10% fines (smaller than 1/20 of the hole diameter). Stemming material shall be placed a minimum vertical length of three borehole diameters above the placed charge within sound rock or concrete. A standard procedure of logging the hole and placing the explosives shall be established to resolve and verify the proper placement of stemming material.
- f. If multiple charges are required, time-delays should be used to reduce the overall detonation pressures to a series of smaller explosions. Delays shall be used to effectively develop the removal while lowering the maximum charge weight per delay to as low as reasonably achievable. Delays of less than a 9-millisecond interval shall not be counted as delays. All charges within any 9-millisecond interval shall be summed to resolve the maximum charge weight per delay for a given shot.
- g. In addition to these measures, the proponent should consider additional mitigation measures including, but not limited to the following: Deployment of barriers or coffer dams in shallow water.

4. *Endangered Species Watch Plan (WP)*

The project proponent shall prepare a WP using the guidance below to ensure that marine mammals and sea turtles are not in the exclusion zone during blasting events.

- a. A formal WP Coordination Meeting shall be held at least one (1) week prior to the first blasting event to review the WP, to discuss the responsibilities of all parties, and to review and approve the schedule of events. Personnel invited to the WP Coordination Meeting shall be contacted at least two (2) weeks prior to the first detonation event. Contacted invitees shall

include the Explosives Engineer, the observation team, FWC, USFWS, NMFS, U.S. Coast Guard, U.S. Army Corps of Engineers, and other interested parties. The agenda shall be coordinated with the FWC, USFWS, and NMFS prior to the meeting. The meeting shall include the latest information concerning the possible presence of manatee, other marine mammals, and sea turtles during blasting, the logistics of the detonation schedule, details of the aerial survey, the communications plan, and the responsibilities of all parties involved.

b. The WP shall include time tables for the endangered species observation periods (e.g., start times for aerial surveys, boat surveys, and land-based surveys), observer positions, and a copy of the WP log sheet and map to record manatee and/or sea turtle sightings.

c. The WP shall include a list of names and qualifications of the observers. Approval of the observers is at the discretion of the FWC, USFWS, and NMFS and will be made prior to the blasting event.

d. The watch crew shall consist of a minimum of a WP Coordinator, four land or boat-based observers, and one aerial observer. All observers shall have had previous experiences in observing/spotting marine mammals and sea turtles or be approved by the FWC, USFWS, and NMFS. The aerial observer shall have a minimum of 30 aerial hours of experience observing sea turtles and marine mammals, a large number of which was flying aerial surveys as a secondary observer during blasting events.

e. Observers shall follow the protocol established for the WP and shall conduct the watch in good faith and to the best of their ability.

f. Each observer shall be equipped with a two-way radio that will be dedicated exclusively to the watch. Observers will be equipped with a cell phone as a backup verbal communications system. Observers shall also be equipped with polarized sunglasses, binoculars, a red flag for backup visual communication, and a sighting log with a map to record sightings.

g. All blasting events shall be weather dependent. Climatic conditions must be suitable for optimal viewing. Slack water, low tide provides optimal viewing conditions. Blasting is prohibited if wind speeds are in excess of 10 knots, during periods of fog and heavy rain. The WP Coordinator shall determine if optimal observation conditions occur prior to initiation of the survey for each blast event.

h. All blasting events shall occur during daylight hours to ensure that optimal observation conditions occur.

i. A continuous aerial survey shall be conducted by helicopter or airplane, beginning one hour prior to the start of blasting. The survey route shall be designed in conjunction with the FWC, USFWS, and NMFS. After detonation, the aerial survey crew will make a complete survey of the blast area. The aerial survey crew shall continue surveillance of the survey areas for 30 minutes post-blast in case there is a need of aerial tracking of an injured sea turtle or marine mammal.

- j. The additional observers shall be located at predetermined positions around the blast site. These positions will be situated to provide maximum visibility of the exclusion zone and will be approved by the FWC, USFWS, and NMFS. The observers shall begin surveying the area one hour prior to the blast event and continue observing for one half hour after the blasting event.
- k. The perimeter of the exclusion zone shall be marked with brightly colored buoys and an added 300-foot radius perimeter around the exclusion zone shall be marked with white buoys for aerial reference.
- l. All of the observers shall be in close communication with the blaster in order to halt the blast event, if the need arises. The event shall be halted (delayed), if a marine mammal or sea turtle is spotted within 300 feet of the perimeter of the exclusion zone. If a marine mammal or sea turtle is observed swimming in the direction of the blast zone and their arrival time is projected to coincide with the blast, the blasting event shall be halted. The blasting event shall be halted immediately upon the request of any observer. The blast shall not take place until the animal(s) move out of the area under its own volition. Animals shall not be herded away or harassed into leaving. If the animal(s) is not sighted a second time, the blasting shall not resume until 30 minutes after the initial sighting.
- m. If an injured or dead marine mammal or sea turtle is sighted after the blasting event, the WP Coordinator shall contact the FWC through their Hotline at 1-888-404-FWCC, the NOAA Fisheries Service's Southeast Regional Hotline at 305-862-2850. Notification shall also be given to the FWC Imperiled Species Management Section at 850-922-4330, and the USFWS at the Jacksonville Ecological Services Office at 904-232-2580 (if the project is located in north Florida), or the Vero Beach Field Office at 772-562-3909 (if in south Florida).
- n. If there are any problems encountered during blasting, the problems shall be evaluated by the observers and explosives engineer. Logistical solutions will be presented to the FWC, USFWS, and NMFS for their approval. Corrections to the WP shall be made prior to the next blasting event.
- o. Within two (2) weeks after completion of all the blasting events, the WP Coordinator will submit a summary report to the FWC, USFWS, and NMFS. The report shall include the observer logs, provide the names of the observers and their positions during the event, the number and location of manatee, other marine mammals, and sea turtles sighted and the actions that were taken when the animals were observed. The report shall reference the appropriate permit or other authorization numbers.

REFERENCES

- Duronslet, M. J., C. W. Caillouet, S. Manzella, K. W. Indelicato, C. T. Fontaine, D. B. Revera, T. Williams, and D. Boss. 1986. The effects of an underwater explosion on the sea turtles *Lepidochelys kempi* and *Caretta caretta* with observations of effects on other marine organisms. Unpublished report submitted to National Marine Fisheries Service Biological Laboratory, Galveston, Texas.
- Fitch, J. E., and P. H. Young. 1948. Use and effect of explosives in California waters. *California Fish and Game* 34:53-70.
- Gitschlag, G. R. 1990. Sea turtle monitoring at offshore oil and gas platforms. Pp. 223-246. *In: Proceedings of the 10th Annual Workshop on Sea Turtle Biology and Conservation*, T. H. Richardson, J. I. Richardson, and M. Donnelly (compiles). NOAA Technical Memorandum NMFS-SEFC-278.
- Gitschlag, G. R., and B. A. Herczeg. 1994. Sea turtle observations at explosive removals of energy structures. *Marine Fisheries Review* 56:1-8.
- Gitschlag, G. R., and M. Renaud. 1989. Sea turtles and the explosive removal of offshore oil and gas structures. Pp. 67-68 in *Proceedings of the 9th Annual Workshop on Sea Turtle Conservation and Biology*, S. A. Eckert, K.L. Eckert, and T. H. Richardson (compilers). NOAA Technical Memorandum NMFS-SEFC-232.
- Hanson, H. F. 1954. Hair seal control program: Copper River and Bering Sea areas. 1954 Annual Report to Alaska Department of Fisheries (Mimeo). [Cited in Wright 1982]
- Hempen, G. L., T. M. Keevin, and H. J. Ruben. 2005. Underwater blast pressures from confined rock removal shots: The Kill Van Kull Deepening Project. *In: Proceedings of the Thirty-first Annual Conference on Explosives and Blasting Technique*, Orlando, Florida. International Society of Explosive Engineers, Cleveland, OH. 11 pp.
- Keevin, T. M. 1998. A review of natural resource agency recommendations for mitigating the impacts of underwater blasting. *Reviews in Fisheries Science* 6:281-313.
- Keevin, T. M., and G. L. Hempen. 1997. The environmental effects of underwater explosions with methods to mitigate impacts. U.S. Department of Defense Legacy Report, U. S. Army Corps of Engineers, St. Louis District. 145 pp. <http://www.denix.osd.mil/denix/Public/ES-Programs/Conservation/WaterX/water1.html>
- Ketten, D. R. 1995. Estimates of blast injury and acoustic trauma zones for marine mammals from underwater explosions. Pp. 391-407. *In: Sensory Systems of Aquatic Mammals*, R. A. Kastelein, J. A. Thomas, and P. E. Nachtigall (editors). De Spil Publishers, Woerden, The Netherlands.

Klima, E. F., G. R. Gitschlag, and M. L. Renaud. 1988. Impacts of the explosive removal of offshore petroleum platforms on sea turtles and dolphins. *Marine Fisheries Review* 50:33-42.

Lewis, J. A. 1996. Effects of underwater explosions on life in the sea. DSTO-GD-0080. Melbourne, Australia.

Nedwell, J. R., and T. S. Thandavamoorthy. 1992. The waterborne pressure wave from buried explosive charges: An experimental investigation. *Applied Acoustics* 37:1-14.

O'Keeffe, D. J., and G. A. Young. 1984. Handbook on the environmental effects of underwater explosions. NSWC TR 83-240. Naval Surface Weapons Center, Dahlgren, VA.

Reiter, G. A. 1981. Cold weather response F/V Ryuyo Maru No. 2 St. Paul, Pribiloff Islands, Alaska. Pp. 227-231. *In: Proceeding of the 1981 Oil Spill Conference*. American Petroleum Institute Publication 4334, Washington, D. C.

Wright, R. A. 1971. Effects of underwater overpressures on sea otters and other aquatic animals. Amchitka Bioenvironmental Program. U.S. Atomic Energy Commission Final Report Contract No. AT (26-1).

Wright, D. G. 1982. A discussion paper on the effects of explosives on fish and marine mammals in the waters of the Northwest Territories. Canadian Technical Report of Fisheries and Aquatic Science 1052:v + 16 pp.

Appendix D

BENTHIC COMMUNITIES ASSESSMENT REPORT

VENETIAN CAUSEWAY PD&E STUDY

From North Bayshore Drive to Purdy Avenue
Miami-Dade County, FL
Financial Management No. 422713-2-22-01
ETDM No. 12756

Benthic Communities Assessment Report

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1.0 INTRODUCTION

The Florida Department of Transportation District VI is conducting a Project Development & Environment (PD&E) study on the rehabilitation or replacement of the Venetian Causeway in Miami-Dade County, Florida. The Venetian Causeway from North Bayshore Drive to Purdy Avenue is comprised of 12 bridges over Biscayne Bay connecting mainland Miami to Miami Beach. **Figure 1: Project Location Map** depicts the location of the project area as well as the numerical designation of each bridge referenced in this report.

As a part of the PD&E study, Stantec biologists conducted a benthic survey of the 12 bridges comprising the Venetian Causeway. The purpose of the survey was to document the existing conditions underneath and adjacent to the bridges and identify the general limits of marine resources including: corals, sponge and seagrasses that occur within 60 feet to the north and south side of each bridge. This data will form the basis of the Essential Fish Habitat (EFH) assessment as required by the 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). This data will also form a partial basis for the Endangered Species Biological Assessment (ESBA) which documents endangered species in the project area and will be used for consultation with the U.S. Fish and Wildlife Service (USFWS) in accordance with Section 7 of the Endangered Species Act (ESA). The objective of the EFH assessment will be to describe how the proposed action may affect EFH designated by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA NMFS) will be also used for consultation with the NMFS.

2.0 METHODS

Prior to the field reviews, NMFS Geographic Information System (GIS) data layers, as well as the NMFS EFH mapper, were utilized to conduct a preliminary determination of potential resources within the project area. The results of these database searches indicated that the areas adjacent to the bridges have the potential to contain EFH for species within the Shrimp, Snapper-Grouper, Spiny Lobster, Red Drum, and Live/Hard bottom/coral Fishery Management Plans (FMPs). The project location is in an area designated by U.S. Fish and Wildlife Service as critical habitat for the West Indian Manatee (*Trichechus manatus*), and designated by the NMFS as critical habitat for the threatened Johnson's Seagrass (*Halophila johnsonii*). In addition, this project occurs within the Biscayne Bay Aquatic Preserve (BBAP), which is also classified by the Florida Department of Environmental Protection (FDEP) as Outstanding Florida Waters (OFW). A prior benthic survey had been conducted for this PD&E study by Stantec biologists in August 2014. This survey effort aimed to update and/or expand upon the findings of that previous survey to document the existing conditions in the areas underneath and adjacent to the Venetian

Causeway Bridges. The 2017 survey covered the westernmost 750 feet of bridge 1 that had been omitted from the 2014 survey due to ongoing construction for emergency repairs which made this area inaccessible to surveyors.

From July 9th to July 11th, 2017, Stantec biologists conducted biological characterizations of the benthic conditions at each of the 12 bridges to a distance of 60 feet on both the north and south ends of each bridge. The survey was accomplished using a combination of snorkel (shallow littoral areas) and SCUBA (water depths exceeded 4-feet). The survey was conducted during the Johnson's seagrass (*H. johnsonii*) growing season, determined by NMFS to be June 1-September 30 (NOAA NMFS, 2010).

Each bridge was surveyed via perpendicular transects from the bridge edges out to 60 feet starting at the end bents. Diver 1 would lay the transect tape, signal to the second diver (Diver 2) to swim the transect line and Diver 2 would record benthic observations along the transect including substrate, depth, species observations, and estimated densities of benthic resources. While Diver 2 was swimming the transect line, Diver 1 would investigate areas outside the limits of the transect to cover the maximum extent of the bay bottom. Diver 1 would then relay to Diver 2 any notable benthic occurrences that may not have been present (or visible) along the transect line. This transect process was repeated at consecutive bridge pilings (or every other piling if benthic conditions had been determined to be uniform per the previous transect data and meandering swims) to the opposite end bent and was performed on both the north and south sides of each bridge. A third diver (Diver 3) surveyed the areas underneath the bridges as well as each bridge piling and documented coral/sponge coverage, substrate, and depth (See **Figure 2: Benthic Survey Representative Methodology & Limits**).

The surveys were conducted during all tidal cycles; however, it should be noted that several bridges in this survey area experience high velocity tidal currents. As such, slack tides (relatively brief in duration) were utilized to their greatest extent to maximize survey efficiency. Water depth varied between zero (0) and fifteen (15) feet, and the visibility varied between three (3) and ten (10) feet. The general limits of the observed benthic resources were mapped using a combination the data points taken in the field using a Trimble® Global Positioning System (GPS) unit and the locations of the recorded transect data which were then overlaid onto a project aerial image using ESRI ArcMap.

3.0 RESULTS

The benthic conditions within the Venetian Causeway survey area were relatively uniform from bridge to bridge. Underneath the bridges, the substrate was mostly bare sand with scattered sponges and tunicates. In general, along the bridge edges and heading waterward, three (3)

distinct benthic communities were observed within the survey limits including: Community no. 1: the shallow, littoral zones, bridge structures & rip-rap/rubble/hard debris areas, Community no. 2: the deeper water, sandy bottom with shell fragments areas, and Community no. 3: the seagrass patches. The locations of these community types are depicted in **Figure 3: Existing Conditions Community Type Map**. Representative photos are provided in the **Appendix**. A list of all species observed during the survey is included in the **Attached Tables 1 and 2**. For further, bridge specific results details please refer to **Figure 4: Existing Conditions Maps: Bridges 1-12**.

The typical benthic habitat at each bridge was characterized by unconsolidated rock/rubble and/or rip-rap around the shallow eastern-western end bents (Community no. 1). As depth increased water-ward of these end bents, the benthic habitat transitions to a sandy bottom with shell fragments and scattered hard-debris (Community no. 2). The high velocity current that portions of community types 1 and 2 are exposed to becomes diminished further from the bridges (around the survey limits) and isolated patches of seagrass were observed in these areas (Community no. 3) at Bridges 1(N), 2 (S), 3(S), 4(N-S), 6(S), 8(N) and 12(N-S). Paddle grass (*Halophila decipiens*) was main species of seagrass found in the survey area; however, shoal grass (*Halodule wrightii*) was observed at Bridge 1(S). The shoal grass was sparse and observed only in one mixed-species seagrass patch alongside paddle grass. The three (3) benthic community types documented in the survey area are further described and categorized in the following sections.

3.1 COMMUNITY NO. 1: THE SHALLOW, SUBTIDAL ZONES, BRIDGE STRUCTURES & RIP-RAP/RUBBLE/HARD DEBRIS AREAS

Community no. 1 was observed within the intertidal to subtidal zone located at the eastern and western terminus (the end bents) of each bridge as well as along the bridge pilings, fenders and the areas immediately adjacent to these vertical structures (See the attached **Figure 3: Existing Conditions Community Type Map** for further details on the location(s) of this community). The benthic substrate in this community was primarily rip-rap, rubble and/or hard debris which was dominated by sponge and tunicates. The depth at the bridge pilings ranged from 8-12 feet deep and the area around these pilings experiences high velocity currents with little abatement. The intertidal/littoral areas of this community type are relatively sheltered from the high velocity currents by the rip-rap/rubble/hard debris and bridge structure and generally occurred in the shallower waters (less than 5 feet) bordering the shorelines. These hard-benthic features provide substrate for a variety of marine organisms, including: algae, sponges, hard corals, soft/octocorals, polychaetes, mollusks, crustaceans, echinoderms, and tunicates. The marine species that were observed within this community included:

Macroalgae:

green (*Batophora* spp.); brown (*Dictyota* sp.); and red (*Laurencia* sp.)

Sponges:

vase sponge (*Ircinia campana*), blackball sponge (*Ircinia strobilina*), red encrusting sponge (*Cliona* sp.); fire sponge (*Tedania ignis*), red sponge (*Amphimedon compressa*)

Scleractinia (Hard) Corals:

lesser starlet coral (*Siderastrea radians*), round starlet coral (*Siderastrea siderea*) ivory brush coral (*Oculina diffusa*), rose coral (*Manicina areolata*), and grooved brain coral (*Diploria labyrinthiformis*), knobby star coral (*Solenastrea hyades*), blushing star coral (*Solenastrea bournoni*)

Soft Corals, Tunicates and Other Groups:

Coelenterata: hydroid (*Eudendrium* sp.); gorgonians/sea whips (*Pseudopterogorgia* spp., *Briareum asbestinum*, *Eunicea* spp., *Leptogorgia* sp.); telesto (*Telesto riisei*), Tunicata: sponge tunicate; unidentified tunicate

This community type was highly variable and substrate coverage by the above species ranged between 25-100% on the rip-rap and hard benthic debris, while nearly all the bridge pilings had coverages between 75-100%. The sponges, octocorals and tunicates tended to amass (become more densely concentrated) on and/or around each other and/or the hard-benthic structures and would become less dense around the edges of these aggregations/hard benthic structures. The most abundant organisms were by far the sponges; in particular, the vase, barrel, fire, and the blackball sponges. Hard corals found within this community were typically small, isolated individual *Siderastrea radians* on the rip-rap/hard benthic debris. Other coral species occurred much less frequently and the majority of the corals in this community were in the less than 10 cm range. Only a few isolated corals measuring greater than 10 cm were observed in this community and were mostly documented on rip-rap around the elbowing areas of the rip-rap near the eastern/western limits of the survey areas. None of these hard corals were observed utilizing any bridge structure (aka pilings, fenders, or end bents) in this community throughout the entire 12 bridge survey area. It should be noted that none of the observed species of coral are listed as threatened or endangered by NOAA NMFS. The fish and fauna observed in this community were also generally small and/or juveniles. The 1) sponges, 2) shallow subtidal bottom, 3) rough, hard, exposed, and stable substrate in subtidal and subtropical conditions, 4) algal communities and 5) the live/hardbottom and coral within this community are considered EFH as identified by the SAFMC of the NMFS.

3.2 COMMUNITY NO. 2: THE DEEPER WATER, SANDY BOTTOM WITH SHELL FRAGMENTS AREAS

Community no. 2 was observed in the more open water regions of the survey that begins roughly five (5) to 15 feet from the bridge edges and towards the middle of the bridges (See the attached **Figure 3: Existing Conditions Community Type Map** for further details on the location(s) of this community). Water depth in this community varied between eight (8) and 15 feet. The benthic conditions in this community type were characterized primarily as sandy bottom with shall fragments and consisted of varying coverages of red, green, and/or brown macroalgae and a similar suite of sponges, octocorals, and tunicates as Community no. 1. The coverages of these macroalgae and sponges were highly variable in this community as well, with coverages ranging between 10-90%. Portions of this community are subject to similar high velocity currents as Community no. 1; however, unlike Community no. 1, there is not as much relief and structure to abate this current. Without the current diminishing relief and structure, sponge aggregations tended to be smaller in this community and were usually found on randomly scattered debris or growing around/on other established sponges/fooholds. The remainder of this sandy bottom with shell fragments area was mostly dominated by red, green, and brown macroalgae and bare substrate. The benthic species that were recorded within this community are as follows:

Macroalgae:

green (*Batophora* spp., *Halimeda opunita*); brown (*Dictyota* sp., *Sargassum* sp.); and red (*Laurencia* sp.)

Sponges:

vase sponge, blackball sponge, red encrusting sponge; fire sponge, red sponge

Soft Corals and Other Groups:

Tunicata: sponge tunicate (*Amaroucium stellatum*); unidentified tunicate

The 1) sponges, 2) unconsolidated bottom, 3) algal communities, and 4) the live/hardbottom within this community are considered EFH as identified by the SAFMC of the NMFS.

3.3 COMMUNITY NO. 3: THE SEAGRASS PATCHES

Community no. 3 was documented at seven (7) of the 12 bridges along the Venetian Causeway. This community represents the seagrass patches which were mostly small, isolated, monospecific patches of paddle grass (*H. decipiens*). This community tended to be found around the outer limits of the survey area (about 55-60 feet from the bridge edges; See the attached **Figure 3: Existing Conditions Community Type Map** for further details on the location(s) of this community) and was comprised of similar benthic substrate as observed in Community no. 2, sandy bottom with shell fragments. The depths in this community ranged from eight (8) to 14

feet. Occurrences of sponges, tunicates and other soft/octocoral organisms were much more sparse in these seagrass areas and the coverage of macroalgae (specifically the green macroalgae, *Batophora* sp.) tended to be higher in these areas (25-75% macroalgal coverage). Bridge 1 was the only bridge that shoal grass (*H. wrightii*) was observed and this species was documented alongside paddle grass in a mixed species patch of seagrass around the southwestern quadrant of the survey area at this bridge. This community was the least abundant community in the survey areas and, although documented at over half of the bridges along the Causeway, the seagrasses patches tended to cover only a few square feet and all occurrences were observed at least 40 feet from the bridge edges. Over the entire survey area for the 12 bridges (over 16 acres of survey area), only approximately 0.06 acres of this community type was documented (less than 1% of the survey area). In addition, the seagrasses within these patches generally had a visually estimated 1-15% coverage. Representative photographs of the seagrasses documented in the survey can be found in the **Appendix**. The 1) estuarine and marine submerged aquatic vegetation (SAV), and the 2) unconsolidated bottom within this community are considered EFH as identified by the SAFMC of the NMFS.

4.0 EFH HABITATS AND SPECIES

The three (3) community types identified during the survey are all viable and functioning ecosystems which currently provide habitat for an array of reed fish, algae, corals, sponges, and other marine life. According to the EFH designations from the SAFMC, the EFH types documented within the survey area for the Venetian Causeway PD&E study include: 1) sponge, 2) the shallow subtidal bottom, 3) the rough, hard, exposed, and stable substrate in subtidal and subtropical conditions, 4) live/hardbottom and coral, 5) algal communities, 6) unconsolidated bottom (i.e. sand/shell substrate), 7) estuarine and marine SAV. These EFH types provide habitat for species within the following Fishery Management Plans (FMPs):

Penaeid Shrimp FMP - Species include: brown (*Penaeus aztecus*), white (*Penaeus setiferus*), and pink (*Penaeus duorarum*) shrimp

Red Drum FMP- Species include: red drum (*Sciaenops ocellatus*)

Snapper Grouper FMP- Species include: 55 different snapper, grouper, sea bass, porgies, jack, wreckfish, tilefishes, triggerfishes, wrasses, spadefishes, and grunt species

Spiny Lobster FMP- Species include: Caribbean spiny lobster (*Panulirus argus*)

Live/Hardbottom, Coral and Coral Reef FMP- Species include: various shallow water, hermatypic stony coral species

5.0 SUMMARY

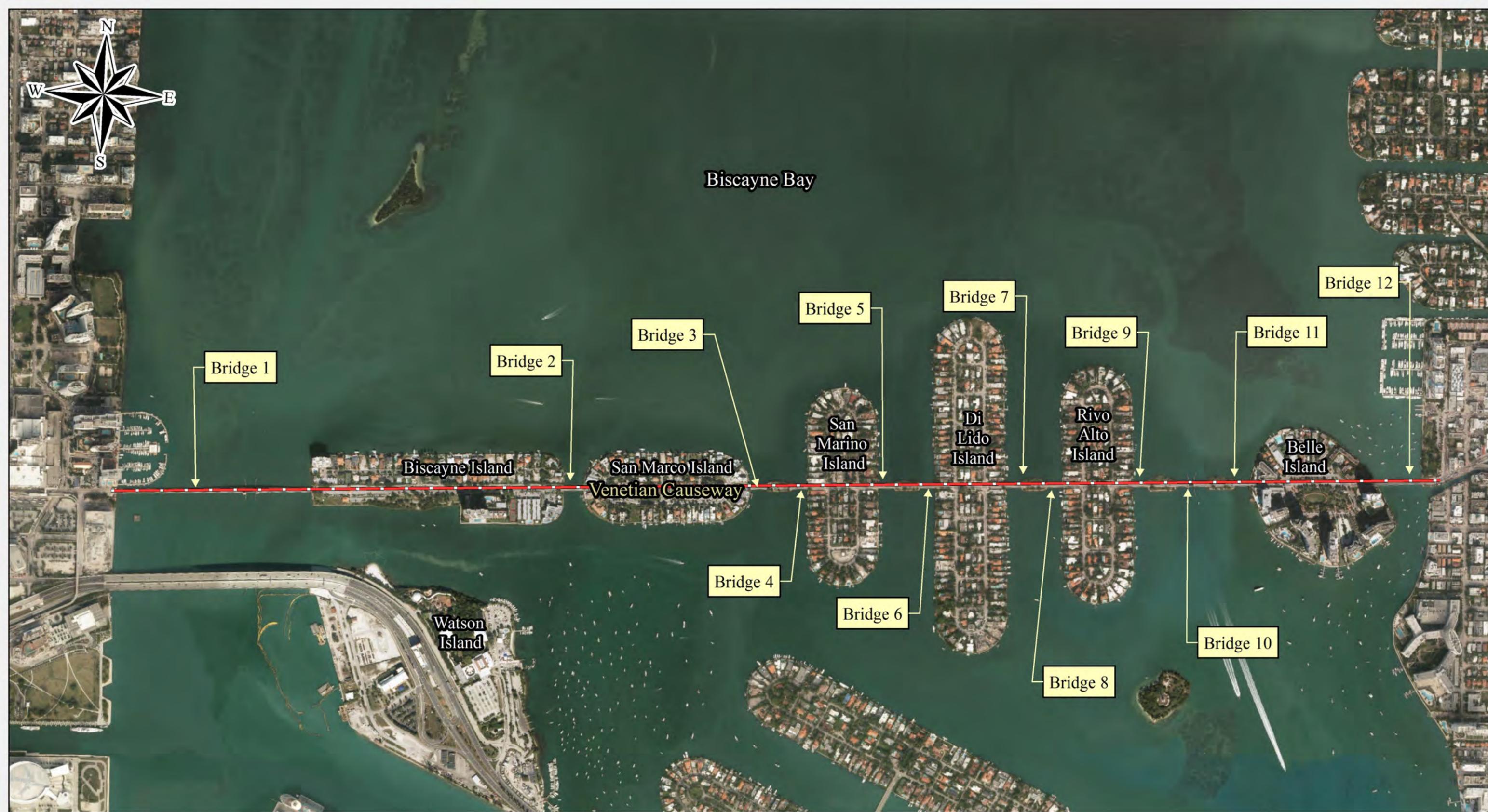
Stantec Consulting Services, Inc. performed a biological characterization of the benthic communities at the Venetian Causeway in Biscayne Bay, FL in August 2014 and again in July 2017. The surveys were conducted in association with the Venetian Causeway PD&E study for the proposed rehabilitation or replacement of the 12 bridges spanning the causeway within the study limits. The purpose of these surveys was to characterize the benthic habitats and identify all marine resources within the vicinity of these bridges in order to determine potential impacts to EFH and other benthic resources. It should be noted that this survey effort included the entirety of bridge 1, which was omitted from the 2014 survey due to ongoing emergency repairs of the westernmost 750 feet of that bridge.

As previously stated, the benthic habitat and condition for the 12 bridges were relatively uniform throughout the survey area. Underneath the bridges (outside of the photic zone) the benthic substrate was primarily bare sand with sporadic, infrequent occurrences of sponges and tunicates. Three (3) distinct benthic communities were observed within the photic zone of the survey area: 1) the shallow, subtidal zones, bridge structures & rip-rap/rubble/hard debris areas, 2) the deeper water, sandy bottom with shell fragments areas, 3) and the seagrass patches. Community no. 1 has the highest percent coverage of benthic resources of any of the communities as the typical condition observed in this community was a dense assemblage of sponges, soft/octocorals, and tunicates. The hard-benthic substrate in Community no. 1 consisted of typical rip-rap boulders around the end bents of the bridges, the vertical bridge structures and scattered benthic debris including concrete slabs, construction debris, sunken dinghy and sailboat, submerged pipes, bicycles, and other random debris. The observed corals within this community tended to be small and were mainly documented on rip-rap away from the bridges edges. The majority of these corals could be relocated if necessary and none of these corals are listed as threatened or endangered species. Community no. 2 had fair to moderate coverage of the same variety of sponges, tunicates and macroalgae which were seemingly random and variable throughout this community. This community displayed the most variation in benthic coverages with areas of nearly 90% coverage of macroalgae (*Halimeda sp.*), areas with mostly bare sandy bottom with shell fragments, areas with dense sponge and tunicate assemblages, as well as areas with mixed coverages of macroalgae, sandy bottom and sponges/tunicates. Community no. 3 was the least observed community in the survey area and each documented occurrence was at least 40 feet from the existing bridge edges. The high velocity current that the areas adjacent to the bridges are exposed to is less apparent in Community no. 3, which may explain how seagrasses are able to establish and colonize further from the project bridges. Although this region of Biscayne Bay is designated as critical habitat for Johnson's seagrass (*H. johnsonii*), this endangered seagrass

was not observed within the survey area. The only seagrass species observed within the study limits were paddle grass (*H. decipiens*) and shoal grass (*H. wrightii*). These observed seagrasses accounted for less than 1% of the surface coverage within the survey area. While direct impacts from bridge construction are not likely due to the distance of the bridges to the seagrass resources, barges may be used for project construction and indirect impacts from barges could potentially occur. Hence it is important to note that all the observed seagrasses were in depths greater than 7 feet and would likely not be impacted by barge traffic.

The potential for impacts to any federal or state protected resources associated with the Venetian Causeway Bridge Project is quite minimal as no substantial protected environmental resources were observed utilizing any existing bridge structure nor were any federal or state listed species observed within the limits of this study. This information will continue to be evaluated and considered to assess avoidance and minimization measures and potential impacts to protected marine resources and EFH.

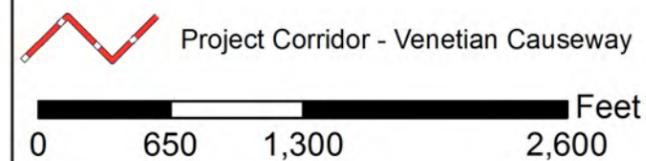
FIGURES



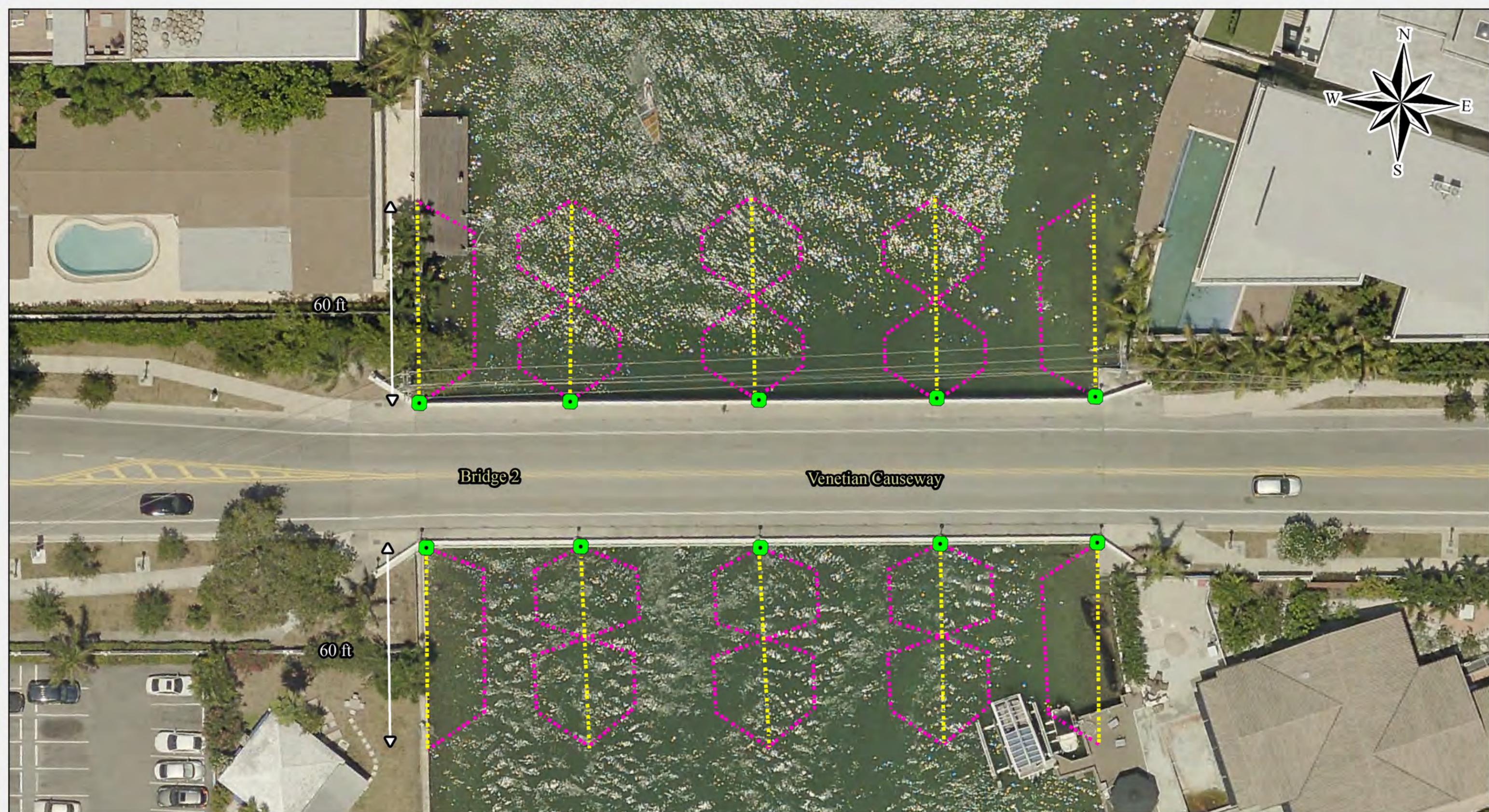
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 901 Ponce De Leon Blvd
 Miami, FL 33134

**VENETIAN CAUSEWAY
 PD&E Study
 From North Bayshore Dr to Purdy Ave
 Miami-Dade County, FL
 Section 32-33, Township 53, Range 42**

Legend



**Project Location
 Map**

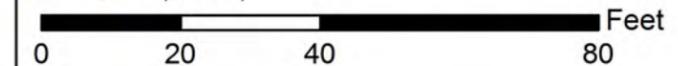


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Legend

- Meandering Swims (Diver 1)
- Transects (Diver 2)
- Underneath Bridge & Piling Survey (Diver 3)



**Benthic Survey
 Representative Methodology**

Note: Paddle grass, *Halophila decipiens* was observed around the northwestern limit of the survey area at Bridge 4 as well as at the southeastern limits of the survey areas at both Bridges 3 and 4. The seagrass coverage ranged from 1-10% and continued outside the survey area. The benthic conditions in the survey areas without hatching were mainly sandy bottom with shell fragments with varying coverage of green, red and/or brown macroalgae and sponges.



Community 1: The Shallow, Littoral Zones, Bridge Pilings & Rip-Rap/Rubble/Hard Debris Areas

Community 2: The Deeper Water, Sandy Bottom with Shell Fragments Areas

Community 3: The Seagrass Patches



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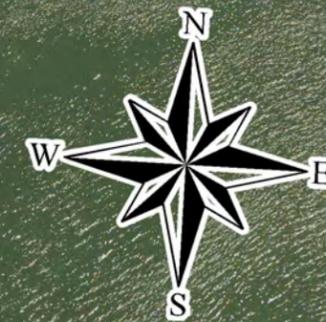
Legend

 Survey Area	 Rip-rap, Rubble and/or Hard Debris
 Seagrass (<i>H. decipiens</i>)	 Sponge Dominated Community

0 35 70 140 Feet

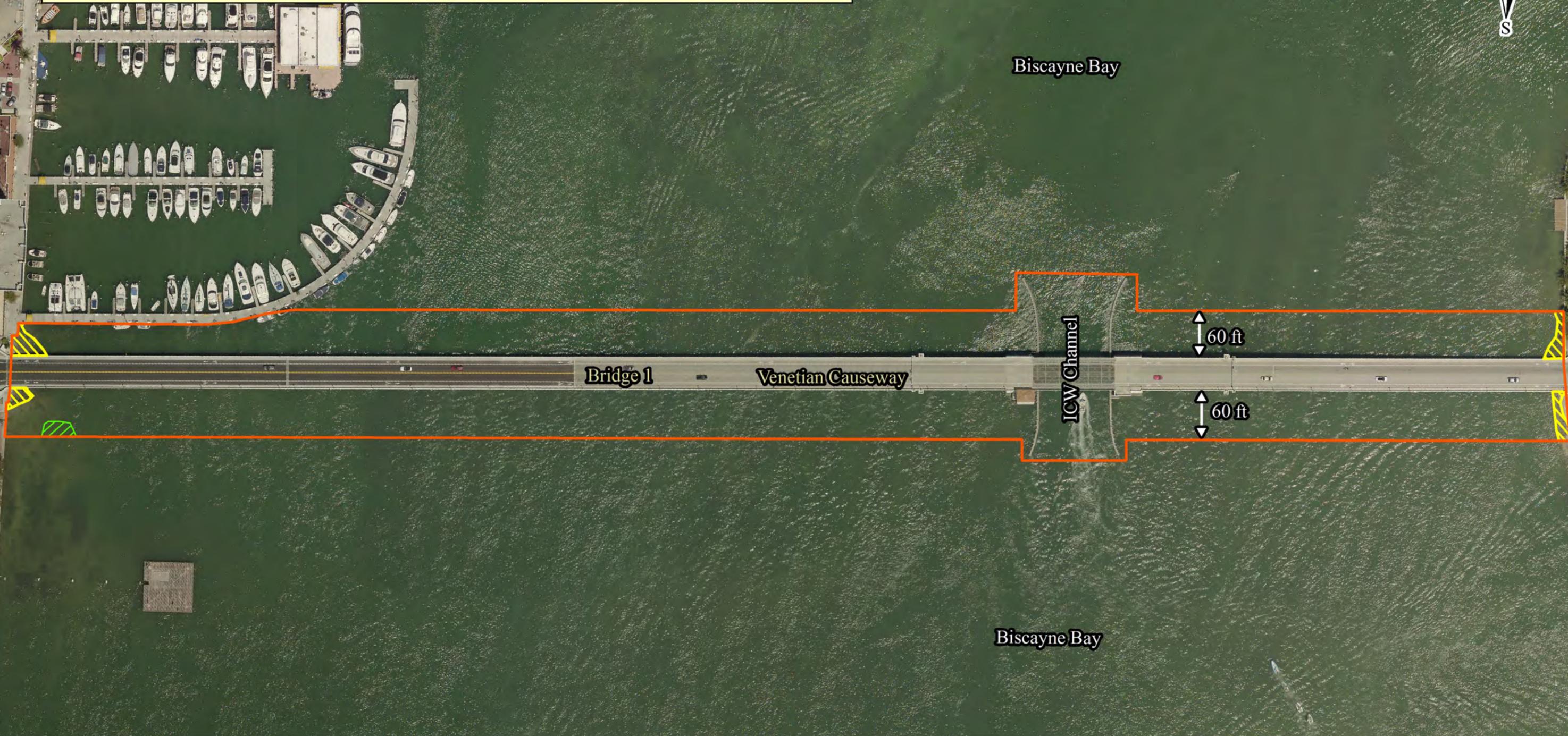
**Existing Conditions
Community Type Map
Bridge 3 and 4**

Note: Two species of seagrass, *Halophila decipiens* and *Halodule wrightii* were observed towards the southwestern limits of the survey area. Coverage of these seagrasses was sparse (1-5%). The benthic conditions in the survey areas with no hatching were mainly sandy bottom with shell fragments and small rocks and had more bare substrate (as opposed to varying coverage of macroalgae and sponges) than the other Venetian Causeway Bridges.



Biscayne Bay

Biscayne Bay

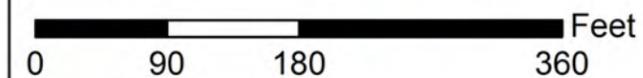


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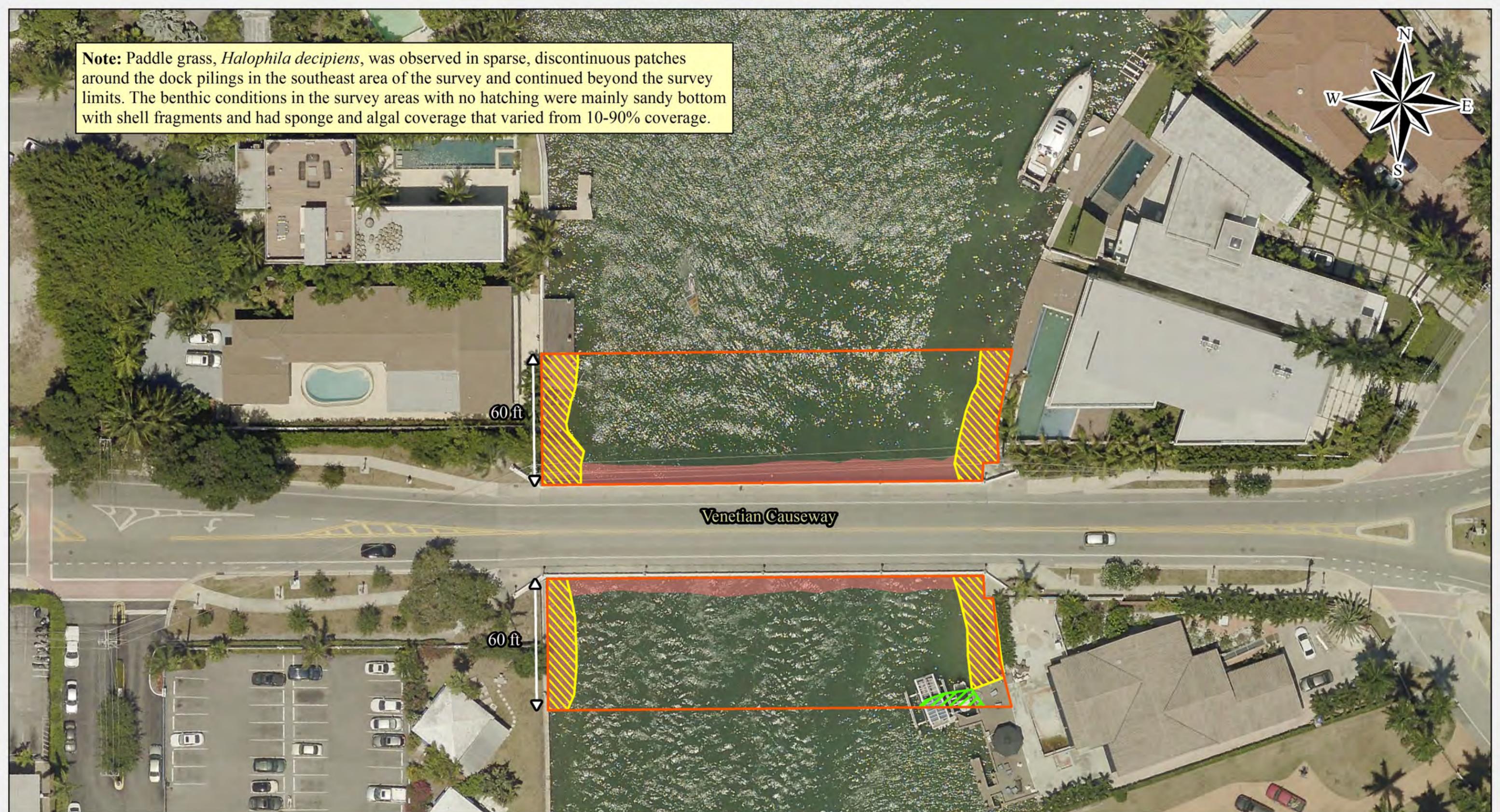
Legend

- Survey Area
- Seagrass (*H. decipiens*, *H. wrightii*)
- Rip-rap, Rubble and/or Hard Debris
- Sponge Dominated Community



**Existing Conditions
Bridge 1**

Note: Paddle grass, *Halophila decipiens*, was observed in sparse, discontinuous patches around the dock pilings in the southeast area of the survey and continued beyond the survey limits. The benthic conditions in the survey areas with no hatching were mainly sandy bottom with shell fragments and had sponge and algal coverage that varied from 10-90% coverage.



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Legend

Survey Area	Rip-rap, Rubble and/or Hard Debris
Seagrass (<i>H. decipiens</i>)	Sponge Dominated Community

0 30 60 120 Feet

**Existing Conditions
Bridge 2**

Note: Paddle grass, *Halophila decipiens* was observed around the northwestern limit of the survey area at Bridge 4 as well as at the southeastern limits of the survey areas at both Bridges 3 and 4. The seagrass coverage ranged from 1-10% and continued outside the survey area. The benthic conditions in the survey areas without hatching were mainly sandy botom with shell fragments with varying coverage of green, red and/or brown macroalgae and sponges.

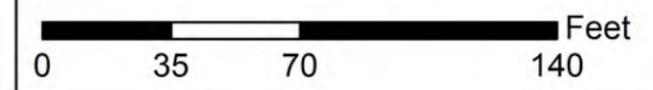


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Legend

- Survey Area
- Rip-rap, Rubble and/or Hard Debris
- Seagrass (*H. decipiens*)
- Sponge Dominated Community



**Existing Conditions
Bridge 3 and 4**

Note: Sparse paddle grass, *Halophila decipiens*, was observed around the southwestern limits of the survey area of Bridge 6. The seagrass coverage in this area was between 1-5%. The benthic conditions in the survey areas without hatching were mainly sandy bottom with shell fragments with varying coverage of green, red and/or brown macroalgae and sponges.

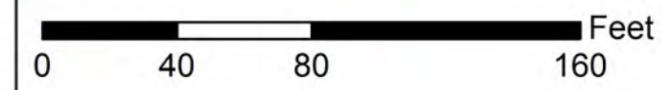


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Legend

- Survey Area
- Rip-rap, Rubble and/or Hard Debris
- Seagrass (*H. decipiens*)
- Sponge Dominated Community



**Existing Conditions
Bridge 5 and 6**

Note: Sparse paddle grass, *Halophila decipiens*, was observed around the northwestern limits of the survey area at Bridge 8. The seagrass coverage in this area was between 1-5%. The benthic conditions in the survey areas with no hatching were mainly sandy bottom with shell fragments and had varying coverage of green, red and/or brown macroalgae and sponges.



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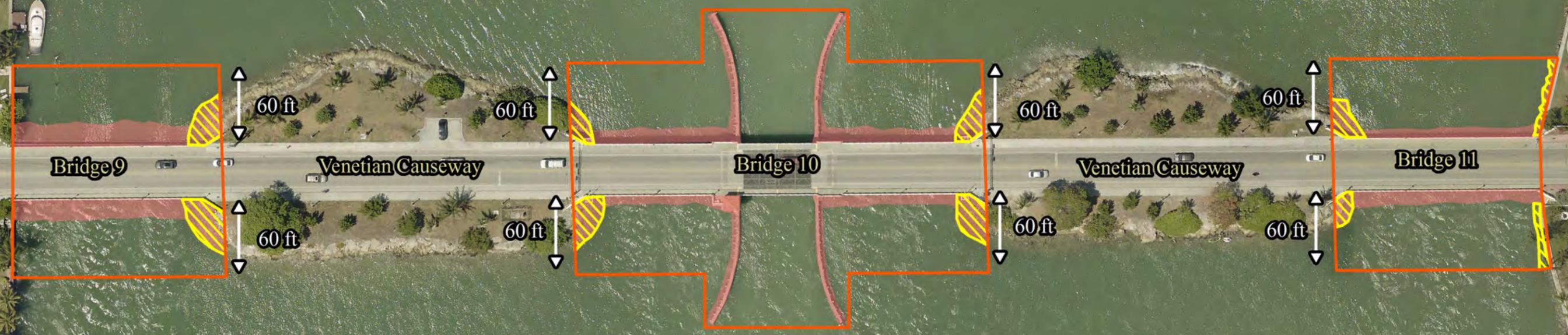
	Survey Area		Rip-rap, Rubble and/or Hard Debris
	Seagrass (<i>H. decipiens</i>)		Sponge Dominated Community

 Feet
0 37.5 75 150

**Existing Conditions
Bridge 7 and 8**

Note: No seagrass was observed within the survey limits at these bridges. The benthic conditions in the survey areas with no hatching were mainly sandy bottom with shell fragments and had varying coverage of green, red and/or brown macroalgae and sponges.

Biscayne Bay



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Legend

	Survey Area		Sponge Dominated Community
	Rip-rap, Rubble and/or Hard Debris		

0 62.5 125 250 Feet

**Existing Conditions
Bridge 9, 10 and 11**

Note: Paddle grass, (*Halophila decipiens*), was the only seagrass species observed in the survey limits. The seagrass area towards the northwest quadrant of the survey area continues north outside the survey limits. The seagrasses in the southwestern portion of the survey area were both isolated patches comprising a few square feet. Overall density of the seagrass in the areas documented inside the survey area ranged from 1-25% coverage. The benthic conditions in the survey areas with no hatching were mainly sandy bottom with shell fragments and had varying coverage of green, red, and/or brown macroalgae and sponges.

Biscayne Bay



Collins Canal

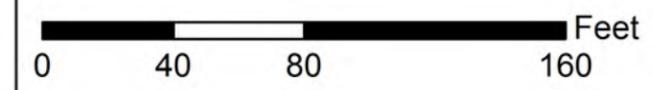


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Legend

- Survey Area
- Seagrass (*H. decipiens*)
- Rip-rap, Rubble and/or Hard Debris
- Sponge Dominated Community



**Existing Conditions
Bridge 12**

TABLES

Table 1: Benthic Species Observations

Species	Occurrence		
	Rare	Frequent	Abundant
Algae			
<i>Batohpora</i> spp.			X
<i>Halimeda</i> spp.		X	
<i>Dictyota</i> spp.			X
<i>Laurencia</i> spp.			X
Seagrass			
<i>Halodule wrightii</i>	X		
<i>Halophila decipiens</i>	X		
Sponges			
<i>Ircinia strobilina</i>			X
<i>Ircinia campana</i>			X
<i>Scopalina</i> spp.		X	
<i>Plexaurella</i> spp.		X	
<i>Amphimedon compressa</i>		X	
<i>Monanchora barbadensis</i>		X	
<i>Plakortis angulospiculatus</i>		X	
Hard (Scleractinia) Corals			
<i>Siderastrea radians</i>	X		
<i>Siderastrea siderea</i>	X		
<i>Oculina diffusa</i>	X		
<i>Solenastrea bournoni</i>	X		
<i>Solenastrea hyades</i>	X		
<i>Manicina areolata</i>	X		
<i>Diploria labyrinthiformis</i>	X		
Octocorals: Soft Corals, Gorgonians & Telestaceans			
<i>Carijoa riisei</i>			X
<i>Psuedopterogorgia</i> spp. (sea plumes)	X		
<i>Briareum asbestinum</i>		X	
<i>Gorgonia ventalina</i>	X		
<i>Cliona</i> spp. (red encrusting sponge)			X
<i>Eunicea</i> spp (knobby sea rods)	X		
<i>Leptogorgia</i> spp(sea whips)	X		
<i>Tedania ignis</i> (fire sponge)			X
<i>Carijoa riisei</i> (white telesto)			X
<i>Pseudoplexaura</i> spp. (porous sea rod)		X	

Table 2: Fish Species Observations

Scientific Name	Common Name	Occurance		
		Rare	Frequent	Abundant
<i>Sphoeroides testudineus</i>	Checkered puffer			X
<i>Lactophrys</i> spp.	Trunkfishes		X	
<i>Equetus punctatus</i>	Spotted Drum	X		
<i>Carcharhinus leucus</i>	Bull shark	X		
<i>Hippocampus</i> spp.	Seahorse	X		
<i>Abudefduf saxatilis</i>	Seargent Major			X
<i>Eucinostomus</i> spp.	Mojarra			X
<i>Lachnolaimus maximus</i>	Hogfish		X	
<i>Pomacanthus arcuatus</i>	Grey Angelfish		X	
<i>Pomacanthus paru</i>	French Angelfish		X	
<i>Urolophus jamaicensis</i>	Yellow Stingray	X		
<i>Dasyatis americana</i>	Southern Stingray		X	
<i>Aetobatus narinari</i>	Spotted Eagle Ray	X		
<i>Haemulon squamipinna</i>	Yellow striped Grunt			X
<i>Stegastes pictus</i>	Black and Yellow Damselfish			X
<i>Sparisoma</i> spp.	Parotffish			X
<i>Haemulon</i> spp.	Grunts			X
<i>Lutjanus apodus</i>	Schoolmaster			X
<i>Stegastes leucostictus</i>	Beaugregory		X	
<i>Snydous</i> spp.	Lizardfish	X		
<i>Sphyræna barracuda</i>	Barracuda		X	
<i>Equetus acuminatus</i>	Highhat		X	
<i>Halichoeres bivittus</i>	Slippery Dick		X	

Representative Photographs

Representative Photographs



Photograph No.: 1

Date: July 11-13, 2017

Location: Venetian
Causeway Bridges over
Biscayne Bay, FL

Notes: The photograph shows an example of the dense sponge, octocoral, and tunicate coverage that is present within Community no.1. This Community was found around the shallow, littoral zone, bridge pilings and rip-rap/rubble/hard debris areas.



Representative Photographs



Photograph No.: 2

Date: July 11-13, 2017

Location: Venetian Causeway Bridges over Biscayne Bay, FL

Notes: The photograph shows the typical conditions of a bridge piling in Community no. 1 (specifically part of the fender system at Bridge 10). Nearly 100% coverage by various sponges, octocorals, and tunicates was documented on nearly all the bridge pilings throughout the Venetian Causeway. No corals were observed on any of these bridge structures (i.e. pilings, end bents and fenders).



Representative Photographs

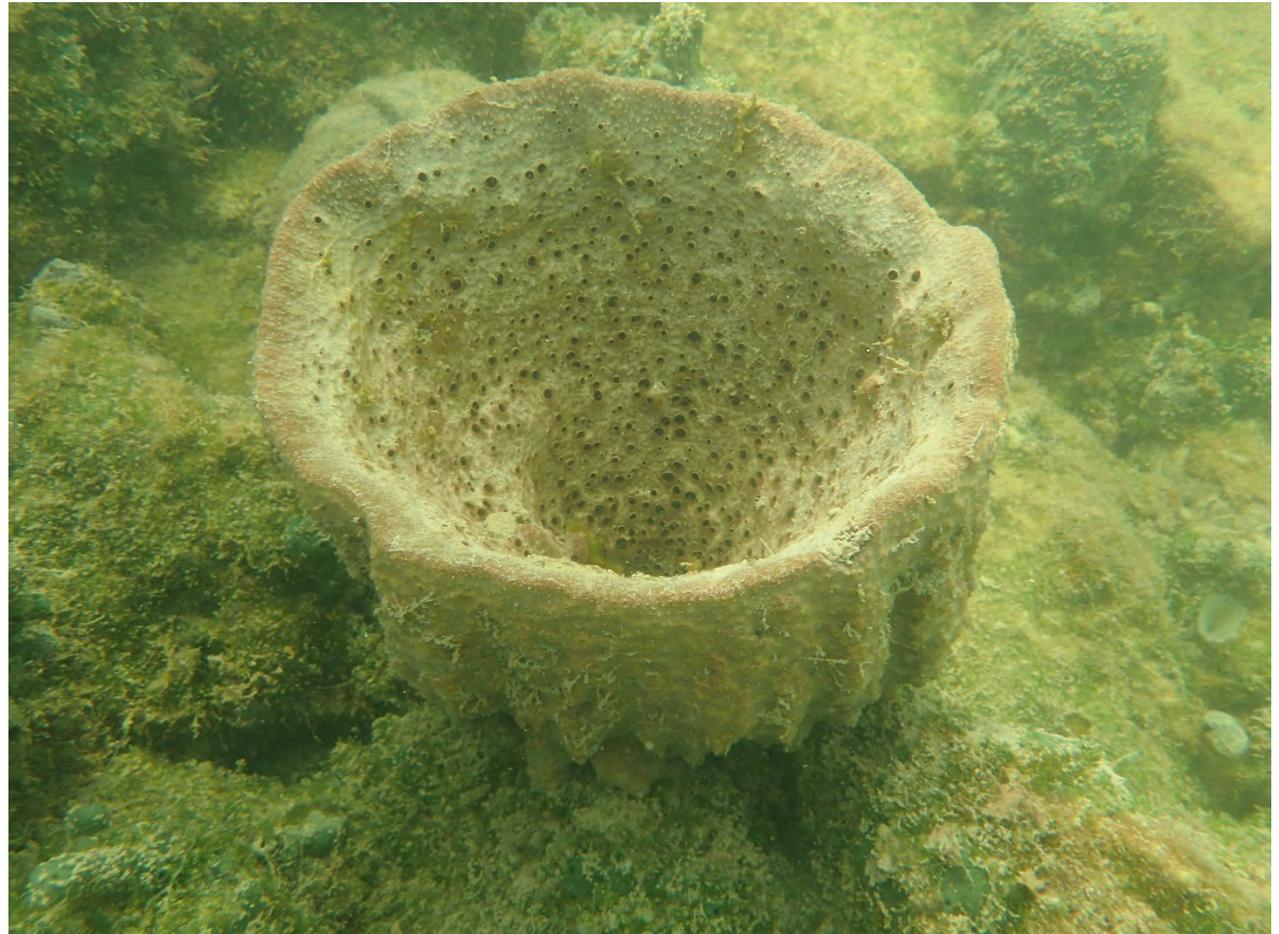


Photograph No.: 3

Date: July 11-13, 2017

Location: Venetian Causeway Bridges over Biscayne Bay, FL

Notes: The photograph documents some of the variety of coverage observed in Community no.1 as the rip-rap shown here is mostly covered in macroalgae with only one vase sponge.



Representative Photographs



Photograph No.: 4

Date: July 11-13, 2017

Location: Venetian Causeway Bridges over Biscayne Bay, FL

Notes: The photograph shows the conditions along a typical transect conducted at the Venetian Causeway Bridges. This photograph depicts Community no. 2; sandy bottom with shell fragments substrate along with varying sponge and algal coverage.



Representative Photographs



Photograph No.: 5

Date: July 11-13, 2017

Location: Venetian
Causeway Bridges over
Biscayne Bay, FL

Notes: The photograph also shows the conditions observed in Community no. 2; sandy bottom with shell fragments substrate along with varying sponge and algal coverage. The sponges in this community tend to aggregate on or around other (i.e. become more densely populated) and/or colonize scattered debris along the bottom.



Representative Photographs

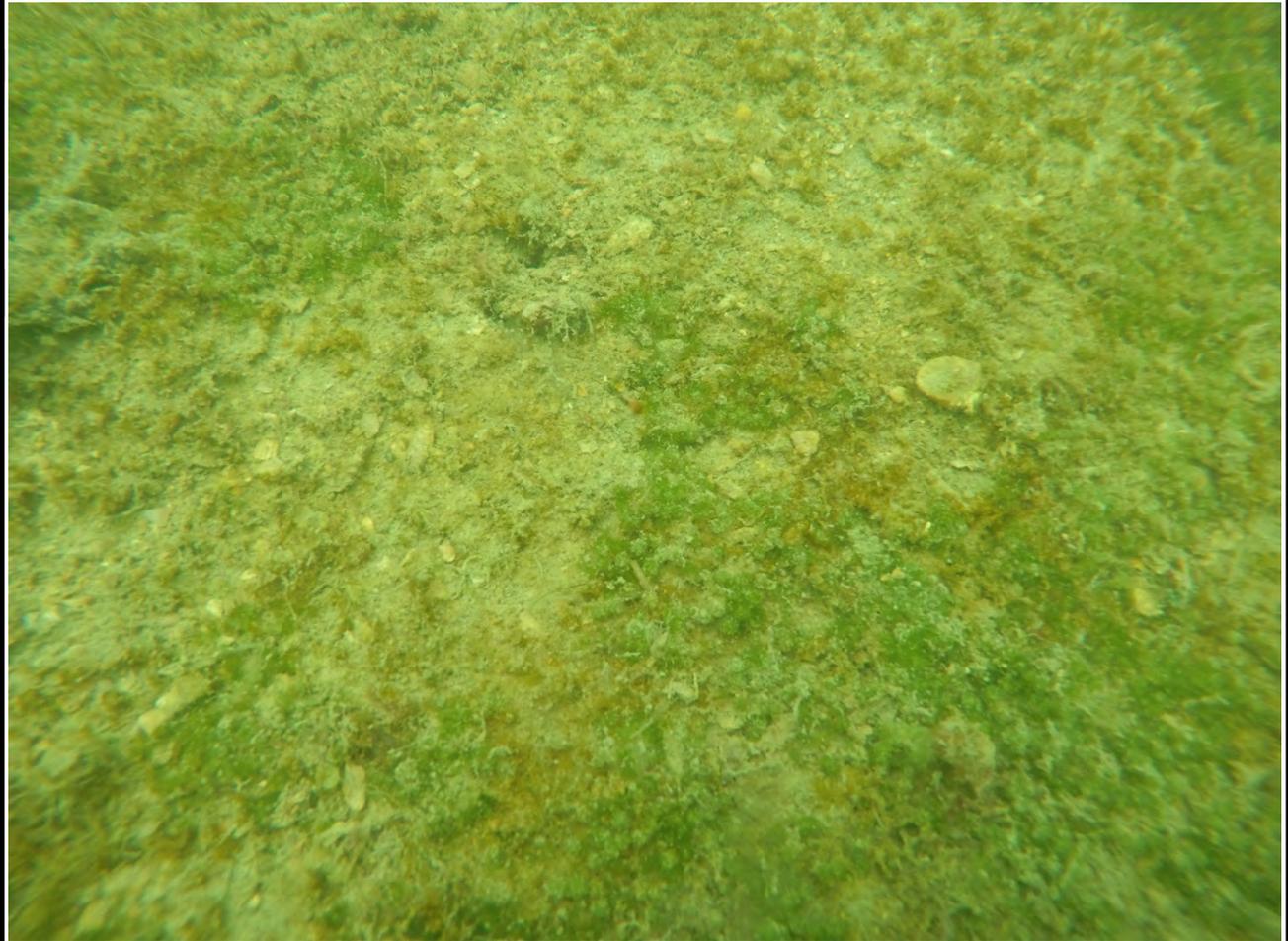


Photograph No.: 6

Date: July 11-13, 2017

Location: Venetian Causeway Bridges over Biscayne Bay, FL

Notes: The photograph shows another example of conditions observed in Community no. 2. This sandy bottom with shell fragments substrate was observed near the area where this community transitions to Community no. 3.



Representative Photographs



Photograph No.: 7

Date: July 11-13, 2017

Location: Venetian
Causeway Bridges over
Biscayne Bay, FL

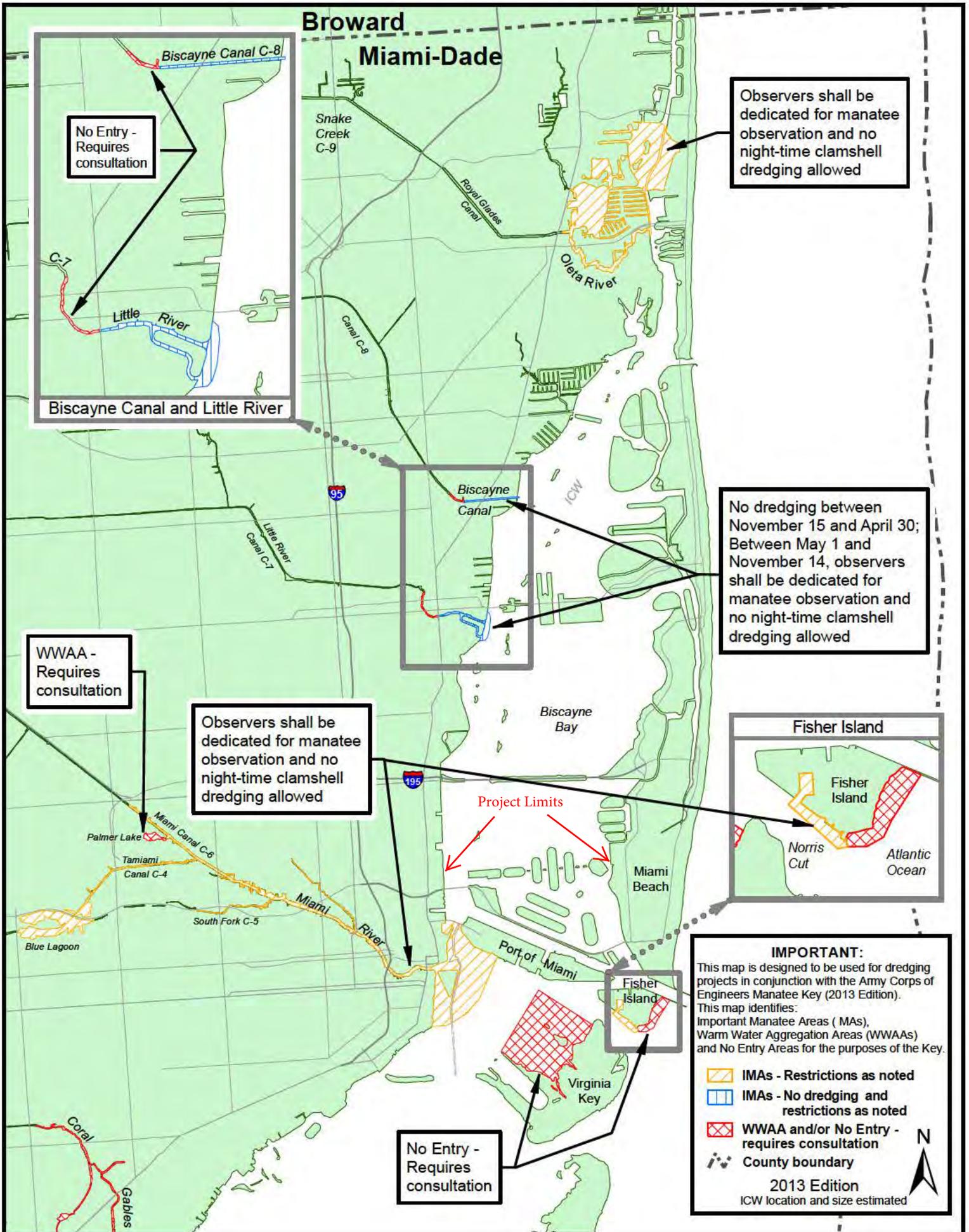
Notes: The photograph shows a small patch of paddle grass (*Halophila decipiens*) with varying coverage of green algae. These conditions were typical of Community no. 3 and tend to occur near the northern-southern edges of the survey areas, around 55-60 feet from the bridge edges.



Appendix E

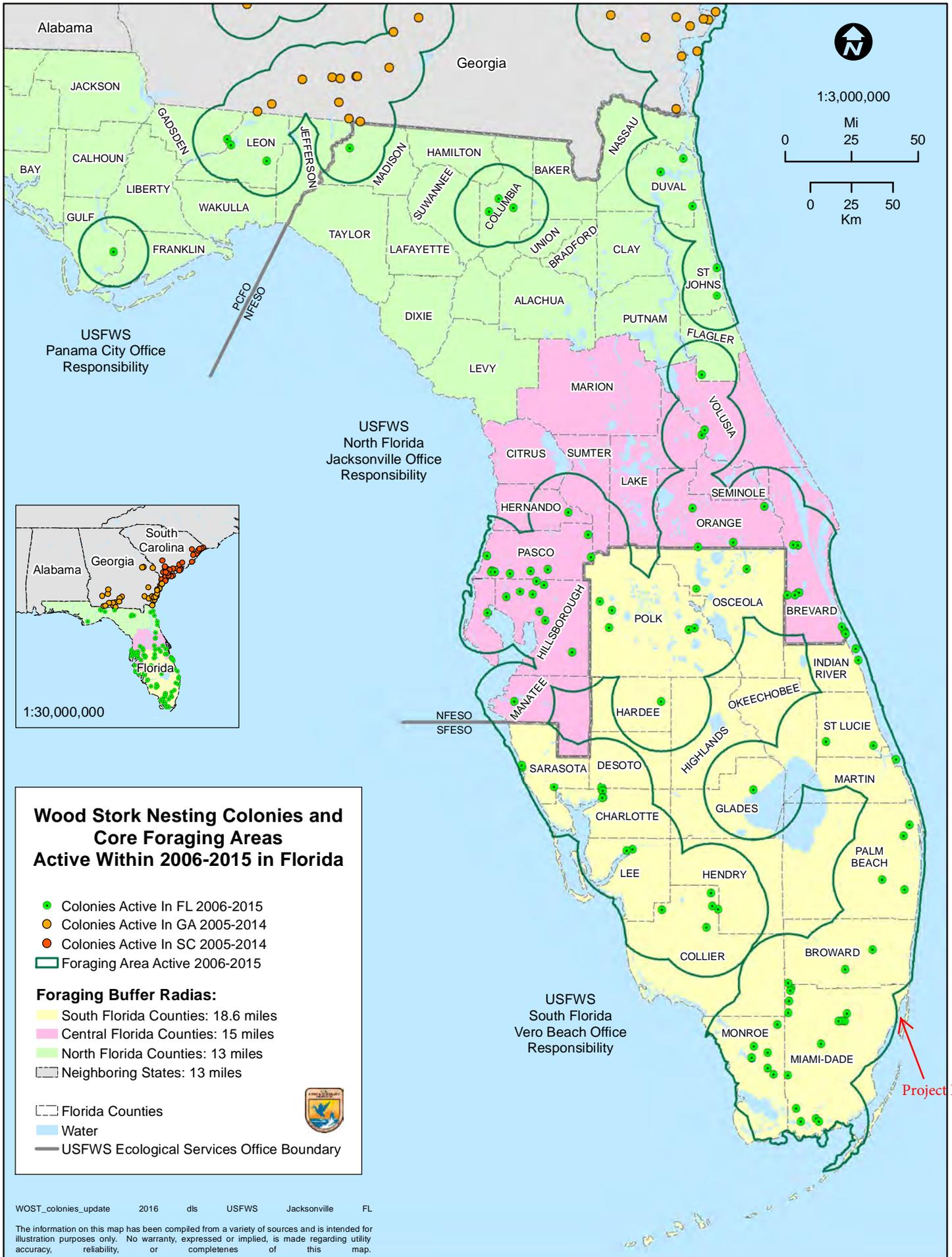
IMPORTANT MANATEE AREAS

Miami-Dade County - North

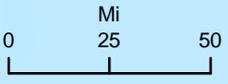


Appendix F

WOOD STORK NESTING COLONIES AND CORE FORAGING AREAS



1:3,000,000



Alabama

Georgia

JACKSON

GADSDEN

LEON

JEFFERSON

MADISON

HAMILTON

BAKER

MASSAU

DUVAL

BAY

CALHOUN

LIBERTY

WAKULLA

TAYLOR

LAFAYETTE

SUWANNEE

COLUMBIA

UNION

BRADFORD

CLAY

GULF

FRANKLIN

PCFO

NFESO

DIXIE

ALACHUA

LEVY

MARION

CITRUS

SUMTER

LAKE

SEMINOLE

ORANGE

FLAGLER

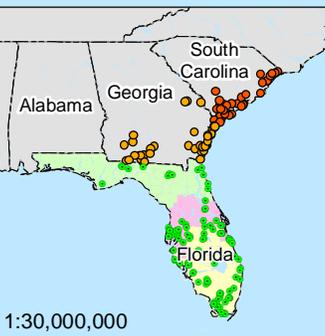
USFWS
Panama City Office
Responsibility

USFWS
North Florida
Jacksonville Office
Responsibility

PUTNAM

ST JOHNS

VOLUNIA



1:30,000,000

Wood Stork Nesting Colonies and Core Foraging Areas Active Within 2006-2015 in Florida

- Colonies Active In FL 2006-2015
- Colonies Active In GA 2005-2014
- Colonies Active In SC 2005-2014
- Foraging Area Active 2006-2015

- Foraging Buffer Radii:**
- South Florida Counties: 18.6 miles
 - Central Florida Counties: 15 miles
 - North Florida Counties: 13 miles
 - Neighboring States: 13 miles

- Florida Counties
- Water
- USFWS Ecological Services Office Boundary



USFWS
South Florida
Vero Beach Office
Responsibility

Project Location

The information on this map has been compiled from a variety of sources and is intended for illustration purposes only. No warranty, expressed or implied, is made regarding utility accuracy, reliability, or completeness of this map.

Appendix G

SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION PROVISIONS



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS

The permittee shall comply with the following protected species construction conditions:

- a. The permittee shall instruct all personnel associated with the project of the potential presence of these species and the need to avoid collisions with sea turtles and smalltooth sawfish. All construction personnel are responsible for observing water-related activities for the presence of these species.
- b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing sea turtles or smalltooth sawfish, which are protected under the Endangered Species Act of 1973.
- c. Siltation barriers shall be made of material in which a sea turtle or smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment. Barriers may not block sea turtle or smalltooth sawfish entry to or exit from designated critical habitat without prior agreement from the National Marine Fisheries Service's Protected Resources Division, St. Petersburg, Florida.
- d. All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.
- e. If a sea turtle or smalltooth sawfish is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle or smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a sea turtle or smalltooth sawfish is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.
- f. Any collision with and/or injury to a sea turtle or smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service's Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.
- g. Any special construction conditions, required of your specific project, outside these general conditions, if applicable, will be addressed in the primary consultation.

Revised: March 23, 2006

O:\forms\Sea Turtle and Smalltooth Sawfish Construction Conditions.doc



Appendix H

WETLAND FIGURES



Florida Department of Transportation
 District 6
 1000 NW 111th Avenue
 Miami-Dade, FL 33172

**VENETIAN CAUSEWAY
 PD&E Study
 From North Bayshore Dr to Purdy Ave
 Miami-Dade County, FL
 Section 32-33, Township 53, Range 42**

Legend

- Project Corridor - Venetian Causeway
 - Wetlands
 - OSW 1
- 0 900 1,800 3,600 Feet

Wetland Figure
 Overview

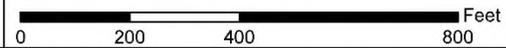


Florida Department of Transportation
 District 6
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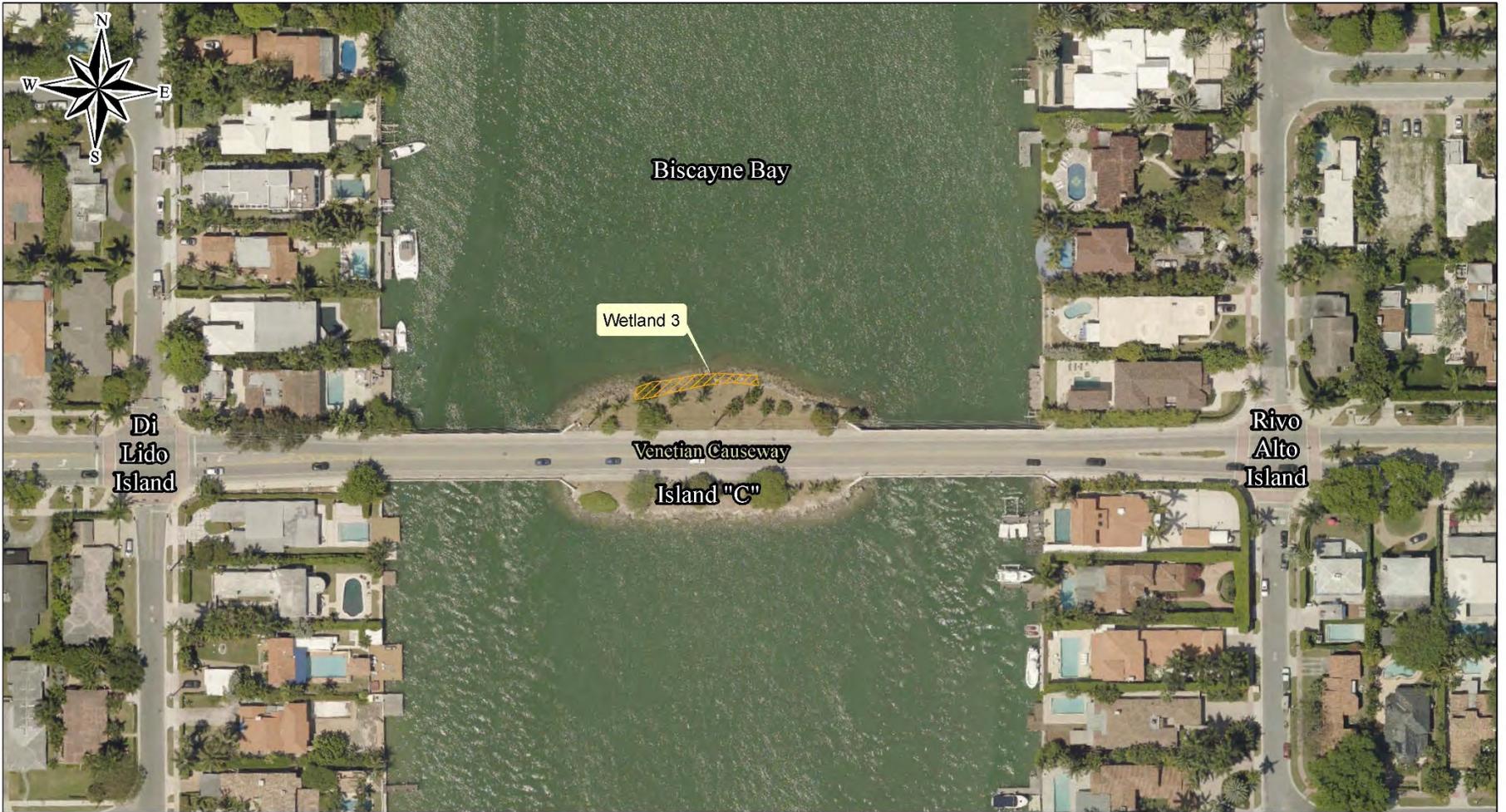
**VENETIAN CAUSEWAY
 PD&E Study
 From North Bayshore Dr to Purdy Ave
 Miami-Dade County, FL
 Section 32-33, Township 53, Range 42**

Legend

 OSW 1  Wetlands



Wetland Figure
 1 of 3

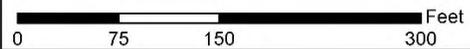


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Legend

 Wetlands



Wetland Figure
 2 of 3

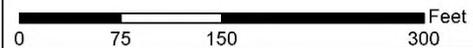


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Legend

 Wetlands



Wetland Figure
 3 of 3