TENTATIVE:
SUBJECT TO
REVISION

TOWN OF PALM BEACH

SHORE PROTECTION BOARD

TOWN HALL
COUNCIL CHAMBERS-SECOND FLOOR
360 SOUTH COUNTY ROAD

AGENDA

MARCH 27, 2025

9:00 AM

Welcome!

For information regarding this agenda and the procedures for public participation at Shore Protection Board, please refer to the end of this agenda.

I. CALL TO ORDER

Melissa Ceriale, Chair
Ronald Matzner, Vice Chair
Lawrence Kaplan
Peter Matwiczyk
James McKelvy
Erick Reickert
Joel Zylstra

II. ROLL CALL

III. PLEDGE OF ALLEGIANCE

IV. APPROVAL OF AGENDA

V. APPROVAL OF MINUTES

A. Minutes of the January 30, 2025 Shore Protection Board Meeting

VI. COMMUNICATIONS FROM CITIZENS - 3 MINUTE LIMIT PLEASE

VII. REACH 7 & 8 DUNE RESTORATION

A. Reach 7 & 8 Dune Restoration

H. Paul Brazil, P.E., Director of Public Works / Sara Gutekunst, Coastal Coordinator

VIII. LAKE WORTH INLET

IX. THE BREAKERS PALM BEACH SHORE PROTECTION

X. GROIN REHABILITATION

A. Groin Rehabilitation

Sara Gutekunst, Coastal Coordinator / Michael Jenkins, Ph.D., P.E., Applied Technology & Management, Inc.

XI. SUMMER/FALL 2025 MEETING SCHEDULE

XII. COMMUNICATIONS FROM SHORE PROTECTION BOARD MEMBERS

XIII. ANY OTHER MATTERS

XIV. ADJOURNMENT

PLEASE TAKE NOTE:

Note 1: Live meeting audio is available on the Town's website at www.townofpalmbeach.com. To listen to the live stream, please visit the Meeting Audio page and select the "In Progress" or "Click Here to Listen" button.

Note 2: In-person or virtual Public Comment is limited to three minutes and must be preceded by your name and address for the record. Alternative public comment is also welcome for Town Council Meetings via four methods:

- To make a public comment virtually (for Town Council Meeting Only), email request to publiccomment@townofpalmbeach.com, and identify desired agenda item(s) to be addressed.
- Written public comment submittals should be sent to publiccomment@townofpalmbeach.com,
- Direct written entry into the public meeting record through the eComment portal, or
- Mail or In-person submittal of written document to the Town Clerk's Office at Town Hall no later than the Friday prior to the meeting.

Note 3: As a public business meeting, the chair retains the right to limit discussion on any issue.

Note 4: If a person decides to appeal any decision made with respect to any matter considered at this meeting, he/she/they will need to ensure that a verbatim record of the proceedings is made for such purposes, which shall include the testimony and evidence upon which the appeal is to be

based.

Note 5: Disabled persons needing accommodations to participate in this meeting are requested to call the Clerk's Office at (561) 838-5416 at least one day prior to the meeting.

PROCEDURES FOR PUBLIC PARTICIPATION

Citizens desiring to address the Town Council should proceed toward the public microphones when the applicable agenda item is being considered to enable the Town Council President to acknowledge you.

PUBLIC HEARINGS: Any citizen is entitled to be heard on an official agenda item under the section entitled "Public Hearings," subject to the three minute limitation.

COMMUNICATIONS FROM CITIZENS: Any citizen is entitled to be heard concerning any matter under the section entitled "Communications from Citizens," subject to the three minute limitation. The public also has the opportunity to speak to any item listed on the agenda, including the consent agenda, at the time the agenda item comes up for discussion.

OTHER AGENDA ITEMS: Any citizen is entitled to be heard on any official agenda item when the Town Council calls for public comments, subject to the three minute limitation.

Shore Protection Board Meetings are public business meetings and, as such, the Shore Protection Board retains the right to limit discussion on any issue.

TOWN OF PALM BEACH

Shore Protection Board on: March 27, 2025

Section of Agenda
Approval of the Minutes

Agenda Title
Minutes of the January 30, 2025 Shore Protection Board Meeting

Presenter

ATTACHMENTS:

- **January 30, 2025, Shore Protection Board Meeting Minutes**

TOWN OF PALM BEACH

MINUTES OF THE SHORE PROTECTION BOARD MEETING HELD ON THURSDAY, JANUARY 30, 2025

I. CALL TO ORDER (Time Stamp: 0:21)

The Shore Protection Board meeting was called to order on Thursday, January 30, 2025, at 9:00am

II. ROLL CALL (Time Stamp: 0:36)

All Board Members were in attendance:
Melissa Ceriale, Chairperson
VACANT, Vice Chairperson
Lawrence Kaplan, Shore Protection Board Member
Peter Matwiczyk, Shore Protection Board Member
Ron Matzner, Shore Protection Board Member
James McKelvy, Shore Protection Board Member
Erick Reickert, Shore Protection Board Member
Joel Zylstra, Shore Protection Board Member

III. PLEDGE OF ALLEGIANCE (Time Stamp: 1:28)

Chairperson Melissa Ceriale led the Pledge of Allegiance.

IV. APPROVAL OF AGENDA (Time Stamp: 1:51)

Motion was made by Board Member Ron Matzner, seconded by Board Member Joel Zylstra to approve the agenda as presented. The motion carried unanimously, 7-0.

V. ELECTION OF THE CHAIR AND VICE-CHAIR OF THE 2025 SHORE PROTECTION BOARD (Time Stamp: 2:15)

Motion was made by Board Member Peter Matwiczyk to elect Melissa Ceriale as Chair, seconded by Board Member Ron Matzner. The motion carried unanimously, 7-0.

Motion was made by Chairperson Melissa Ceriale to elect Ron Matzner as Vice Chairperson, seconded by Board Member Lawrence Kaplan. The motion carried unanimously, 7-0.

VI. APPROVAL OF THE MINUTES OF THE NOVEMBER 14, 2024, MEETING (Time Stamp: 4:45)

Motion was made by Board Member, Erick Reickert, seconded by Vice Chairperson, Matzner to approve the minutes with corrections. The motion was carried unanimously, 7-0.

VII. COMMUNICATIONS FROM CITIZENS - 3 MINUTES LIMIT PLEASE (Time Stamp: 5:48)

Diane Buehler, Friends of Palm Beach, provided an update of the debris collected on the beaches.

(Time Stamp: 9:29) Tom Warnke Chapter Stake Holder, Liaison for Surfrider Foundation for Palm Beach County. Mr. Warnke shared a letter was sent from the Foundation to the Shore Protection Board indicating they do not object to South Palm Beach Dune Project. Mr. Warnke had comments regarding the Truck Haul Project for Reaches 8 & 9.

VIII. FEMA MAPS UPDATE (Time Stamp: 14:16)

Sara Gutekunst, Coastal Coordinator, introduced Craig Hauschild, P.E., Civil Engineer of Planning & Zoning, to present an update on the FEMA maps. Mr. Hauschild provided an address to view maps at either the Town's website, www.Town of Palm Beach, or contacting Planning & Zoning via email at PZB@Townofpalmbeach.com for assistance. Discussion and map presentation ensued.

IX. STATE OF THE BEACHES (Time Stamp: 33:52)

Ms. Gutekunst, introduced Michael Jenkins, Ph.D., P.E., Coastal Engineering Principal, Applied Technology & Management, Inc. who provided a presentation of the state of the beaches. Discussion ensued.

X. COASTAL PROJECTS UPDATE & ANNUAL REPORT (Time Stamp: 1:14:06)

[Michael Jenkins, Ph.D., P.E., Coastal Engineering Principal, Applied Technology & Management, Inc.]

Patricia Strayer, P.E. Town Engineer, shared that there is quite a bit on the Coastal Program to manage and introduced Sara Gutekunst to give an update. Ms. Gutekunst gave a Phipps Park Dredging Project update. Dredging is almost complete and looks great. Paul Brazil, P.E., Director of Public Works, provided a Reach 8 trucking update. Discussion ensued.

XI. COMMUNICATIONS (Time Stamp: 2:41:18)

Patricia Strayer, P.E., Town Engineer, shared communications for the North projects. Actions are being taken by Staff and clear directions have been received by the Shore Protection Board. Ms. Strayer shared that the Annual Report was received via email to Board Members and should be on the agenda for a vote. The Annual Report will be brought to the February 11, 2025 Town Council meeting. Board Member Peter Matwiczyk chose to move to supplement agenda by adding a vote on the Annual Report.

Motion was made by Board Member Peter Matwiczyk to add supplement to the agenda to vote on Annual Report as written and Town Staff will present to Town Council. Motion seconded by Chairperson Melissa Ceriale. The motion was carried unanimously, 7-0.

Thomas Pierro, P.E., Coastal Protection Engineering (CPE), discussed and gave an update presentation on the Reach 8 EIS. Discussion ensued.

CPE is working to secure permits from the USACE and FDEP placing sand in Reach 8. FDEP notified our team that our application package was deemed complete on December 13, 2024. The final submittal of information requested from FDEP was provided prior to that on December 4, 2024, which started a 90-day timeclock to draft the permit. After these 90 days, FDEP will deliver their Notice of Intent to issue a Joint Coastal Permit, which will include a Public Notice requirement and draft permit language. USACE's permit is pending FDEP's issuance of the Joint Coastal Permit. USACE's Final Environmental Impact Statement (FEIS) is complete and is pending a Record of Decision after the FDEP permit is issued. Absent any formal objections following the Public Notice, the FDEP permit is expected to be issued in the next couple of months. The USACE does not operate under any specific timelines.

XII. ESTABLISH SHORE PROTECTION BOARD GOALS FOR 2025 CALENDAR YEAR (Time Stamp: 2:45:27)

Patricia Strayer indicated that the Board's goals were defined at the November 2024 meeting, which is primarily communication. The March meeting will include a resilience discussion and lakeside, in addition to other items to be discussed at the meeting.

Ms. Strayer provided an overview of Sunshine Law to new and existing members to avoid violations in the future. The Board needs to utilize Staff and stressed the Board is not to communicate with each other via email or via telephone on Board related items.

XIII. 2025 MEETING SCHEDULE (Time Stamp:)

Ms. Strayer, shared the next meeting will be held on March 27, 2025.

XIV. COMMUNICATIONS FROM SHORE PROTECTION BOARD MEMBERS (Time Stamp: 2:58:32)

Board Member Matwiczyk mentioned he has a video to share indicating what the forepassing looked like when it was done two (2) years ago. Ms. Strayer responded to send the video to Staff and it will be forwarded to the Board.

Board Member, Ronald Matzner, suggested including other communities, South Palm Beach, Lake Worth Beach, in our communications and social media. Mr. Matzner spoke with the director of the Citizen's Association to offer Lake Worth Beach a column in the Citizen's Association newsletter to let Palm Beach know what they are doing on the beach and in the community and to share Palm Beach's communications with them as well.

Board Member, James McKelvy indicated that he was interested in getting information on the living shoreline project at PBCC is that forthcoming. Ms. Strayer responded that Staff will put a memo together and send it out in a week.

Board Member, Lawrence Kaplan is interested in groin rehabilitation. He wanted to also share greater communication is a big motivation and initiative for the Board and that stakeholders may be impacted by decisions to be considered and the sooner the Board can communicate issues and build knowledge amongst the community that the average person does not consider or think about, the sooner the better.

XV. ANY OTHER MATTERS (Time Stamp:)

XVI. ADJOURNMENT (Time Stamp: 3:02:2)

There being no further business, the Shore Protection Board of January 30, 2025, was adjourned at 12:02pm. Motion was made to adjourn the meeting by Chairperson Ceriale, seconded by Board Member Kaplan. Motion carried unanimously 7-0.

APPROVED:

_____

Melissa Ceriale,
Chairperson

Meeting audio is located at https://townofpalmbeach.granicus.com/player/clip/3111?view_id=5&redirect=true

TOWN OF PALM BEACH

Shore Protection Board on: March 27, 2025

Section of Agenda
REACH 7 & 8 DUNE RESTORATION

Agenda Title
Reach 7 & 8 Dune Restoration

Presenter
H. Paul Brazil, P.E., Director of Public Works / Sara Gutekunst, Coastal Coordinator

ATTACHMENTS:

- **Reach 7 & 8 Dune Resoration**

FLORIDA DEPARTMENT OF
Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Ron DeSantis
Governor

Alexis A. Lambert
Secretary

CONSOLIDATED JOINT COASTAL PERMIT AND SOVEREIGN SUBMERGED LANDS AUTHORIZATION

PERMITTEE:
Town of Palm Beach
Attn: Sara Gutekunst
P.O. Box 2029
Town of Palm Beach, FL 33480

AGENT:
Coastal Protection Engineering
Attn: Thomas Pierro, PE, BC.CE
5301 N. Federal Hwy, Suite 335
Boca Raton, FL 33487
tpierro@coastalprotectioneng.com

PERMIT INFORMATION:
Permit Number: 0436972-001-JC

Project Name: Reach 8 Beach and Dune Restoration

County: Palm Beach

Issuance Date: March 6, 2025

Expiration Date: March 6, 2040

REGULATORY AUTHORIZATION:

This permit is issued under the authority of Chapter 161 which includes consideration of the provisions contained in Part IV of Chapter 373, Florida Statutes (F.S.), and Title 62, Florida Administrative Code (F.A.C.). Pursuant to Operating Agreements executed between the Department of Environmental Protection (Department) and the water management districts, as referenced in Chapter 62-113, F.A.C., the Department is responsible for reviewing and taking final agency action on this activity.

PROJECT DESCRIPTION:

The project is to conduct beach and dune restoration and periodic maintenance of approximately 1.3 miles of the Town of Palm Beach's shoreline using beach compatible material from approved offshore borrow areas or upland sand sources. Offshore beach compatible material will be transported to the project site from dredge stockpile(s) authorized under the Palm Beach Island Beach Management Agreement (BMA). Additionally, beach compatible material may be sourced from BMA approved upland sand mines as needed.

The dune and beach design template includes a dune feature with a variable crest width incorporating a 1V:50H (Vertical : Horizontal) seaward slope from the landward limit of fill, with a maximum seaward crest elevation of +14.5 feet NAVD88, then a seaward slope of 1V:4H to existing grade or to the flat constructed beach berm. The beach berm template, between

approximately R-129 and R-131, features a variable berm width at a maximum elevation of +7.5 feet NAVD88, then a seaward slope of 1V:10H to existing grade as shown on the permit sketches.

A substantial portion of hardbottom lies within the proposed project's Equilibrium Toe of Fill (ETOF). The Department has determined that 8.79 acres of mitigative artificial reef will be required to offset 6.17 acres of direct and indirect impacts to nearshore hardbottom resources.

PROJECT LOCATION:

The beach and dune restoration site is located between Department Range Monuments R-129 -210' and R-134 +135', in Palm Beach County, Section 26 and 35, Township 44 South, Range 43 East, in the Atlantic Ocean, Class III Waters.

PROPRIETARY AUTHORIZATION:

This activity also requires a proprietary authorization, as the activity is located on sovereign submerged lands held in trust by the Board of Trustees of the Internal Improvement Trust Fund (Board of Trustees), pursuant to Article X, Section 11 of the Florida Constitution, and Sections 253.002 and 253.77, F.S. The activity is not exempt from the need to obtain a proprietary authorization. The Board of Trustees delegated, to the Department, the responsibility to review and take final action on this request for proprietary authorization in accordance with Section 18-21.0051, F.A.C., and the Operating Agreements executed between the Department and the water management districts, as referenced in Chapter 62-113, F.A.C. This proprietary authorization has been reviewed in accordance with Chapter 253 F.S., Chapter 18-21 and Section 62-330.075, F.A.C., and the policies of the Board of Trustees.

The Department has determined that the beach and dune restoration activity and construction of the mitigative artificial reef qualifies for a Letter of Consent to use sovereign, submerged lands, as long as the work performed is located within the boundaries as described herein and is consistent with the terms and conditions herein. Therefore, consent is hereby granted, pursuant to Chapter 253.77, F.S., to perform the activity on the specified sovereign submerged lands.

COASTAL ZONE MANAGEMENT:

This permit constitutes a finding of consistency with Florida's Coastal Zone Management Program, as required by Section 307 of the Coastal Zone Management Act.

WATER QUALITY CERTIFICATION:

This permit constitutes certification of compliance with state water quality standards pursuant to Section 401 of the Clean Water Act, 33 U.S.C. 1341.

OTHER PERMITS:

Authorization from the Department does not relieve you from the responsibility of obtaining other permits (Federal, State, or local) that may be required for the project. When the Department received your permit application, a copy was sent to the U.S. Army Corps of

Engineers (Corps) for review. The Corps will issue their authorization directly to you or contact you if additional information is needed. If you have not heard from the Corps within 30 days from the date that your application was received by the Department, contact the nearest Corps regulatory office for status and further information. Failure to obtain Corps authorization prior to construction could subject you to federal enforcement action by that agency.

AGENCY ACTION:

The above named Permittee is hereby authorized to construct the work that is outlined in the Project Description and Project Location of this permit and as shown on the approved permit drawings, plans and other documents attached hereto. This agency action is based on the information submitted to the Department as part of the permit application, and adherence with the final details of that proposal shall be a requirement of the permit. **This permit and authorization to use sovereign submerged lands are subject to the General Conditions, General Consent Conditions, Specific Conditions, and attached Plans which are a binding part of this permit and authorization.** Both the Permittee and their Contractor are responsible for reading and understanding this permit (including the permit conditions and the approved permit drawings) prior to commencing the authorized activities, and for ensuring that the work is conducted in conformance with all the terms, conditions and drawings.

GENERAL CONDITIONS:

1. All activities authorized by this permit shall be implemented as set forth in the project description, permit drawings, plans and specifications approved as a part of this permit, and all conditions and requirements of this permit. The permittee shall notify the Department in writing of any anticipated deviation from the permit prior to implementation so that the Department can determine whether a modification of the permit is required pursuant to Rule 62B-49.008, F.A.C.

2. If, for any reason, the permittee does not comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department and the appropriate District office of the Department with a written report containing the following information: a description of and cause of noncompliance; and the period of noncompliance, including dates and times; and, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

3. This permit does not eliminate the necessity to obtain any other applicable licenses or permits that may be required by federal, state, local or special district laws and regulations. This permit is not a waiver or approval of any other Department permit or authorization that may be required for other aspects of the total project that are not addressed in this permit.

4. Pursuant to Sections 253.77 and 373.422, F.S., prior to conducting any works or other activities on state-owned submerged lands, or other lands of the state, title to which is vested in the Board of Trustees, the permittee must receive all necessary approvals and authorizations under Chapters 253 and 258, F.S. Written authorization that requires formal execution by the Board of Trustees shall not be considered received until it has been fully executed.

5. Any delineation of the extent of a wetland or other surface water submitted as part of the permit application, including plans or other supporting documentation, shall not be considered specifically approved unless a specific condition of this permit or a formal determination under Section 373.421(2), F.S., provides otherwise.

6. This permit does not convey to the permittee or create in the permittee any property right, or any interest in real property, nor does it authorize any entrance upon or activities on property which is not owned or controlled by the permittee. The issuance of this permit does not convey any vested rights or any exclusive privileges.

7. This permit or a copy thereof, complete with all conditions, attachments, plans and specifications, modifications, and time extensions shall be kept at the work site of the permitted activity. The permittee shall require the contractor to review the complete permit prior to commencement of the activity authorized by this permit.

8. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel with proper identification and at reasonable times, access to the premises where the permitted activity is located or conducted for the purpose of ascertaining compliance with the terms of the permit and with the rules of the Department and to have access to and copy any records that must be kept under conditions of the permit; to inspect the facility, equipment, practices, or operations regulated or required under this permit; and to sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

9. At least 48 hours prior to commencement of activity authorized by this permit, the permittee shall electronically submit to the Department, by email at JCPCompliance@dep.state.fl.us, and the appropriate District office of the Department a written notice of commencement of construction indicating the actual start date and the expected completion date and an affirmative statement that the permittee and the contractor, if one is to be used, have read the general and specific conditions of the permit and understand them.

10. If any prehistoric or historic artifacts, such as pottery or ceramics, stone tools or metal implements, shipwreck remains or anchors, dugout canoes or other physical remains that could be associated with Native American cultures, or early Colonial or American settlement are encountered at any time within the project site area, the permitted project shall cease all activities involving subsurface disturbance in the immediate vicinity of

such discoveries. The permittee, or other designee, shall contact the Florida Department of State, Division of Historical Resources, Compliance and Review Section at (850)245-6333 or (800)847-7278, as well as the appropriate permitting agency office. Project activities shall not resume without verbal and/or written authorization from the Division of Historical Resources. In the event that unmarked human remains are encountered during permitted activities, all work shall stop immediately and the proper authorities notified in accordance with Section 872.05, F.S.

11. Within 30 days after completion of construction or completion of a subsequent maintenance event authorized by this permit, the permittee shall electronically submit to the Department, by email at JCPCompliance@dep.state.fl.us, and the appropriate District office of the Department a written statement of completion and certification by a registered professional engineer. This certification shall state that all locations and elevations specified by the permit have been verified; the activities authorized by the permit have been performed in compliance with the plans and specifications approved as a part of the permit, and all conditions of the permit; or shall describe any deviations from the plans and specifications, and all conditions of the permit. When the completed activity differs substantially from the permitted plans, any substantial deviations shall be noted and explained on as-built drawings electronically submitted to the Department, by email at JCPCompliance@dep.state.fl.us.

GENERAL CONSENT CONDITIONS:

1. Authorizations are valid only for the specified activity or use. Any unauthorized deviation from the specified activity or use and the conditions for undertaking that activity or use shall constitute a violation. Violation of the authorization shall result in suspension or revocation of the grantee's use of the sovereignty submerged land unless cured to the satisfaction of the Board.

2. Authorizations convey no title to sovereignty submerged land or water column, nor do they constitute recognition or acknowledgment of any other person's title to such land or water.

3. Authorizations may be modified, suspended or revoked in accordance with their terms or the remedies provided in Sections 253.04 and 258.46, F.S., or Chapter 18-14, F.A.C.

4. Structures or activities shall be constructed and used to avoid or minimize adverse impacts to sovereignty submerged lands and resources.

5. Construction, use or operation of the structure or activity shall not adversely affect any species that is endangered, threatened or of special concern, as listed in Rules 68A-27.003, 68A-27.004 and 68A-27.005, F.A.C.

6. Structures or activities shall not unreasonably interfere with riparian rights. When a court of competent jurisdiction determines that riparian rights have been unlawfully affected, the structure or activity shall be modified in accordance with the court's decision.

7. Structures or activities shall not create a navigational hazard.

8. Activities shall not interfere with the public easement for traditional uses of the sandy beaches provided in section 161.141, F.S.

9. Structures shall be maintained in a functional condition and shall be repaired or removed if they become dilapidated to such an extent that they are no longer functional. This shall not be construed to prohibit the repair or replacement subject to the provisions of Rule 18-21.005, F.A.C., within one year, of a structure damaged in a discrete event such as a storm, flood, accident or fire.

10. Structures or activities shall be constructed, operated and maintained solely for water dependent purposes, or for non-water dependent activities authorized under paragraph 18-21.004(1)(g), F.A.C., or any other applicable law.

SPECIFIC CONDITIONS:

1. Pursuant to Chapter 161.141, F.S., prior to construction of the beach and dune restoration, the Board of Trustees must establish the line of mean high water for any area affected by this project that does not already have an Erosion Control Line (ECL). This is required to establish the boundary line between sovereignty lands of the state bordering on the Atlantic Ocean and the upland properties. No work shall commence until the Erosion Control Line has been established to the satisfaction of the Department and recorded in the public records of the county in which the project is located.

2. Unless otherwise specified in the specific conditions of this permit, all submittals required herein (e.g., progress reports, water-quality reports etc.) shall be electronically submitted (via e-mail, file transfer site or hard drive). Email submittals shall be sent to the Department's JCP Compliance Officer (e-mail address: JCPCompliance@dep.state.fl.us). If a file transfer site is used, a link shall be e-mailed to the JCP Compliance Officer. If data are too large to be submitted via e-mail or file transfer site, the Permittee may submit the data via an external hard drive, provided by the Permittee. The external hard drive shall be mailed to:

   Department of Environmental Protection
   Office of Resilience and Coastal Protection
   Attn: JCP Compliance Officer
   2600 Blair Stone Road, Mail Station 3544
   Tallahassee, FL 32399-2400

3. The Permittee shall not store or stockpile tools, equipment, materials, etc., within littoral zones or elsewhere within surface waters of the state without prior written approval from the Department. Storing, stockpiling or accessing equipment on, in, over or through areas with benthic biological resources (including beds of submerged aquatic vegetation [SAV], wetlands, oyster reefs or hardbottom) is prohibited unless it occurs within a work area or ingress/egress corridor that is specifically approved by this permit and is shown on the approved permit drawings. Anchoring or spudding of vessels and barges within areas with benthic biological resources is also prohibited.

4. The Permittee shall not conduct project operations or store project-related equipment in, on or over dunes, or otherwise impact dune vegetation, outside the approved staging, beach access and dune restoration areas designated in the permit drawings.

5. For each construction event under this permit, no work shall commence until the Permittee has satisfactorily submitted all information noted in this condition. At least 45 days prior to commencement of construction, the Permittee shall submit the following items for review by the Department. Unless otherwise notified by the Department within 15 days of receipt of all information specified below, the Permittee shall assume the submittals are satisfactory:

    a. An electronic copy of detailed ***final construction plans and specifications*** for all authorized activities. The plans and specifications must be consistent with the project description, conditions and approved drawings of this permit. These documents shall be certified by a professional engineer (P.E.), who is registered in the State of Florida. The Permittee shall point out any deviations from the Project Description of this permit (as stated above) or the approved permit drawings (attached to this permit), and any significant changes that would require a permit modification. The plans and specifications shall include a description of the dredging and construction methods to be utilized and drawings and surveys that show all biological resources and work spaces (e.g., anchoring areas, pipeline corridors, staging areas, boat access corridors, etc.) to be used for this project.

    b. Documentation that the ***Erosion Control Line*** has been executed and recorded in the County Records.

    c. ***Turbidity Monitoring:*** In order to assure that turbidity levels do not exceed the compliance standards established in this permit, construction at the project site shall be monitored closely by an independent third party with formal training in water quality monitoring and professional experience in turbidity monitoring for coastal construction projects. Also, an individual familiar with beach construction techniques and turbidity monitoring shall be present at all times when turbidity generating activities are occurring. This individual shall have authority to alter construction

techniques or shut down the dredging or beach construction operations if turbidity levels exceed the compliance standards established in this permit.

i. ***Qualifications***. The names, credentials (demonstrating experience and qualifications) and 24-hour contact information of those individuals performing these functions.

ii. A ***Scope of Work*** for the turbidity monitoring to ensure that the right equipment is available to conduct the monitoring correctly at any location, and under any conditions.

iii. ***Draft turbidity sampling map.*** An example of the geo-referenced map that will be provided with turbidity reports, including aerial photography and the boundaries of biological resources and/or OFW (pursuant to Specific Condition 26i).

iv. Prior to the second event authorized under this permit, and each subsequent event, the results of the intermediate turbidity monitoring shall be evaluated and provided to the Department. If the results indicate that the project can be built using a smaller mixing zone, this adjustment shall be made through an administrative modification to the permit prior to commencement of construction.

d. ***Biological Monitoring:***

i. ***Qualifications***. Biological monitoring qualifications of firms and their staff shall be submitted to the JCP Compliance Officer for review and approval. If additional monitoring team(s) are subcontracted, or new staff are added to the monitoring team, proposed changes and qualifications shall be submitted to the JCP Compliance Officer for review and approval at least 30 days prior to a monitoring event. Surveys, relocations, and monitoring shall only be conducted by personnel that meet the requirements set forth in Specific Condition 27a. The Permittee's selected biological monitoring firm is fully responsible for training of new staff members and subcontractors, as well as the QA/QC verification of their work.

ii. Prior to the initial (first) fill placement event ONLY, the Permittee shall submit:

(1) ***A Mitigative Artificial Reef Placement Report***. The final and complete set of artificial reef placement reports ("Florida Artificial Reef Materials Placement Report and Post-Deployment Notification") submitted to the FWC Artificial Reef Program (see Specific Conditions 6c and 6d of this Permit).

(2) ***Notification of Coral and Octocoral Relocation***. The Permittee or their Agent shall provide written notification of the date that coral relocation was completed (see Specific Condition 29). Notification shall also certify that: 1) all coral colonies required to be relocated prior to the initial placement of fill were removed from construction areas and transplanted to the mitigative reef; and, 2) that Pre-Relocation, disease related survey requirements were met.

e. ***Fish & Wildlife Monitoring Qualifications*:** To ensure that individuals conducting monitoring of fish and wildlife resources have appropriate qualifications, the Permittee shall provide documentation demonstrating expertise/experience in surveying the types of resources that are present in the project. The Department and the Florida Fish and Wildlife Conservation Commission (FWC) will review this information for confirmation that the monitors are capable of meeting the requirements in Specific Conditions 11 through 23. This documentation shall include the following:

i. ***Marine Turtle Protection****:* A list of the names and FWC permit numbers for the Marine Turtle Permit Holders.

ii. ***Shorebird Protection****:* A list of Bird Monitors with their contact information, summary of qualifications including bird identification skills, and avian survey experience, proposed locations of shorebird survey routes, and the locations of travel routes.

f. Documentation from the U.S. Fish and Wildlife Service (FWS) that this work will be covered under a Statewide Programmatic **Biological Opinion** or a Biological Opinions (BO) issued for construction on this project site. If the BO contains conditions that are not already contained herein, a permit modification may be required prior to construction to include those additional conditions.

g. Documentation confirming that the approved upland source is currently producing the quantity and quality of the authorized sand product required for the upcoming event, as required by Specific Condition 10.

h. ***Pre-Construction Conference.*** **After all items required by a through g above have been submitted to the Department,** the Permittee shall conduct a pre-construction conference to review the specific conditions and monitoring requirements of this permit with the Permittee's contractors, the engineer of record, those responsible for turbidity monitoring, those responsible for protected species monitoring, staff representatives of the Fish and Wildlife Conservation Commission (FWC) and the JCP Compliance Officer (or designated alternate) prior to each construction event. In order to ensure that appropriate representatives are available, at least twenty-one (21) days prior to the intended commencement date for the permitted construction, the

Permittee is advised to contact the Department, and the other agency representatives listed below:

DEP, JCP Compliance Officer
e-mail: JCPCompliance@dep.state.fl.us

FWC Imperiled Species Management Section
e-mail: marineturtle@myfwc.com

Florida Fish & Wildlife Conservation Commission
Division of Marine Fisheries
Artificial Reef Program,
620 S. Meridian Street
Tallahassee, FL 32399
e-mail: ArtificialReefs@MyFWC.com

FWC, Regional Biologist
See Contact list for phone numbers (http://myfwc.com/conservation/you-conserve/wildlife/shorebirds/contacts)

The Permittee is also advised to schedule the pre-construction conference at least a week prior to the intended commencement date. At least seven (7) days in advance of the pre-construction conference, the Permittee shall provide written notification, advising the participants of the agreed-upon date, time and location of the meeting, and also provide a meeting agenda and a teleconference number.

If the actual construction start date is different from the expected start date proposed during the preconstruction conference, at least 48 hours prior to the commencement of each dredging event, the Permittee shall ensure that notification is sent to the FWC, at marineturtle@myfwc.com, indicating the actual start date and the expected completion date. The Permittee shall also ensure that all contracted workers and observers are provided a copy of all permit conditions.

6. **Artificial Reefs**

a. Pursuant to Section 379.249, F.S., the transport and deployment of all artificial reef materials off Florida require a cargo manifest. As a requirement of this permit, the Permittee shall fill out the "Florida Artificial Reef Materials Cargo Manifest and Pre-Deployment Notification" form and maintain the manifest on the vessel, listing the materials onboard, during transport and deployment of artificial reef materials. The completed form shall be submitted to the FWC Artificial Reef Program at least 7 days prior to the anticipated deployment via e-mail ArtificialReefs@MyFWC.com, or via fax (850) 487-4847. The form is also available online at:

https://myfwc.com/fishing/saltwater/artificial-reefs/.

b. Pursuant to Section 379.249, F.S., the FWC is required to track all artificial reef deployments state-wide. As a requirement of this permit, the Permittee shall fill out the "Florida Artificial Reef Materials Placement Report and Post-Deployment Notification" form and submit it to the FWC within 30 days of completion for each date of deployment or separate deployment location. The completed form shall be submitted to the FWC Artificial Reef Program via email ArtificialReefs@MyFWC.com via fax (850) 487-4847, or mailed to the FWC Artificial Reef Program, 620 S. Meridian Street, Box 4B2, Tallahassee, FL 32399-1600. The form is also available online at: https://myfwc.com/fishing/saltwater/artificial-reefs/.

c. When submitting these forms to FWC (Specific Conditions 6b and 6c), the Permittee shall also e-mail copies to the JCP Compliance Officer. Please indicate on the e-mail that the information is being submitted for the Reach 8 Beach and Dune Restoration project, Permit No. 0436972-001-JC, as required by Specific Condition 2.

d. The Permittee shall additionally submit all permit-required artificial reef-related post-construction monitoring reports to the FWC Artificial Reef Program via email artificialreefdeployments@myfwc.com, or by regular mail: FWC Artificial Reef Program 1875 Orange Ave East 4B2, Tallahassee, FL 32311.

7. **Coral Relocation.** An FWC Relocation Special Activity License (SAL) is required for all marine species relocation activities statewide, including but not limited to coral mitigation relocation activities. Information on the FWC SAL Program and applications are available here: https://myfwc.com/license/saltwater/special-activity-licenses/. Please ensure that the contractor conducting any coral relocation activities applies for and receives an FWC Relocation SAL. A Relocation SAL will not be issued for any project that is not otherwise fully permitted, unless agreed upon by the permitting agencies.

8. Sediment quality shall be assessed as outlined in the Offshore Sediment QA/QC Plan dated June 10, 2013 (attached) and the Upland Sediment QA/QC Plan dated July 10, 2013 (attached). Placement of material that is not in compliance with the Plan shall be handled according to the protocols set forth in the Sediment QA/QC Plan. The sediment testing result shall be submitted to the Department within 90 days following the completion of beach construction. The following requirements are included in the Sediment QA/QC Plan:

a. If, during construction, the Permittee determines that the beach fill material does not comply with the sediment compliance specifications, the Permittee shall take

measures to avoid further placement of noncompliant fill, and the sediment inspection results shall be reported to the Department.

b. The Permittee shall submit post-construction sediment testing results and an analysis report as outlined in the Sediment QA/QC plan to the Department within 90 days following beach construction. The sediment testing results will be certified by a P.E. or P.G. from the testing laboratory. A summary table of the sediment samples and test results for the sediment compliance parameters as outlined in Table 1 of the Sediment QA/QC plan shall accompany the complete set of laboratory testing results. A statement of how the placed fill material compares to the sediment analysis and volume calculations from the geotechnical investigation shall be included in the sediment testing results report.

c. A post-remediation report containing the site map, sediment analysis, and volume of non-compliant fill material removed and replaced shall be submitted to the Department within 7 days following completion of remediation activities.

9. Upland sand sources must adhere to the sediment compliance specifications outlined in the Palm Beach Island Beach Management Agreement (2021).

10. Prior to each construction event, the Permittee (or Permittee's Representative) shall submit documentation confirming that the authorized upland sand source(s) is currently producing both the quantity and quality of the authorized sand product(s) to meet the needs of the upcoming event. The documentation shall be signed and sealed by a Registered Professional in the State of Florida (i.e., a P.E. or P.G.) and shall indicate the name(s) of the product(s), the upland sand source(s) and the approximate volume (per product per source) needed for the upcoming event. The Permittee shall submit the documentation to the Department as a preconstruction submittal item no later than 45 days prior to construction.

FISH AND WILDLIFE – SPECIFIC CONDITIONS

11. **In-water Activity.** The Permittee shall adhere to the following requirements for all in-water activity:

a. The Permittee shall instruct all personnel associated with the project about the presence of marine turtles and manatees, and the need to avoid collisions with (and injury to) these protected marine species. The Permittee shall be responsible for harm to these resources and shall require their contractors to advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees or marine turtles, which are protected under the Endangered Species Act, the Marine Mammal Protection Act, the Marine Turtle Protection 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 project area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels shall follow routes of deep water whenever possible.

c. Siltation or turbidity barriers (if used) shall be made of material in which manatees and marine turtles cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers shall not impede manatee or marine turtle movement or travel.

d. The Permittee is responsible for all on-site project personnel and shall require them to observe water-related activities for the presence of marine turtles and manatee(s). All in-water operations shall be immediately shut down if a marine turtle or manatee comes within 50 feet of the operation. For unanchored vessels, operators shall disengage the propeller and drift out of the potential impact zone. If drifting would jeopardize the safety of the vessel then idle speed may be used to leave the potential impact zone. Activities shall not resume until the animal(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the animal(s) has not reappeared within 50 feet of the operation. Animals shall not be herded away or harassed into leaving.

e. Any collision with (or injury to) a marine turtle or manatee shall be reported immediately to the FWC Hotline at 888-404-3922, and to the FWC at ImperiledSpecies@MyFWC.com. Any collision with (and/or injury to) a marine turtle shall also be reported immediately to the Sea Turtle Stranding and Salvage Network (STSSN) at SeaTurtleStranding@MyFWC.com.

f. Temporary signs concerning manatees shall be prominently posted prior to and during all in-water project activities, at sufficient locations to be regularly and easily viewed by all personnel engaged in water-related activities. Two temporary signs, which have already been approved for this use by the FWC, shall be posted at each location. One sign shall read "Caution Boaters - Watch for Manatees". A second sign measuring at least 8 ½" by 11", shall explain the requirements for "Idle Speed/No Wake" and the shutdown of in-water operations. All signs shall be removed by the Permittee upon completion of the project. These signs can be viewed at MyFWC.com/manatee. Questions concerning these signs can be sent to ImperiledSpecies@MyFWC.com.

12. **Construction Area Project Lighting.**

No temporary lighting of the construction or staging areas is authorized at any time

during the main portion of marine turtle nesting season (May 1 through October 31). During early and late nesting season, direct lighting of the beach and nearshore waters shall be limited to the immediate area of active construction. Staging areas, if allowed on the nesting beach, shall not be illuminated unless specifically reviewed and authorized by FWC.

Lighting on offshore and onshore equipment shall be minimized by reducing the number of fixtures, shielding, lowering the height and appropriately placing fixtures to avoid excessive illumination of the water's surface and nesting beach. The intensity of lighting shall be reduced to the minimum standard required for general construction area safety. Shields shall be affixed to the light housing on dredge and on land-based lights and shall be large enough to block lamp light from being transmitted outside the construction area or to the adjacent marine turtle nesting beach. (Figure 1 below).

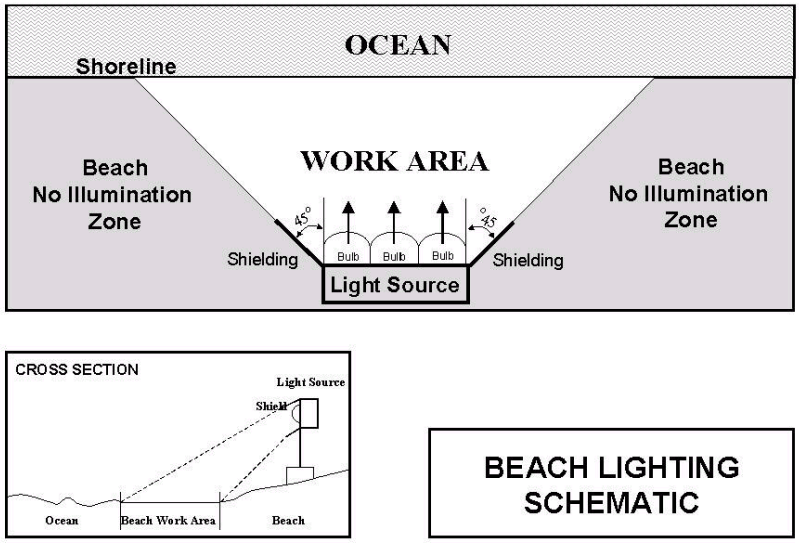

Figure 1

13. **Wildlife Conditions for All Beach Related Activities.** The Permittee shall adhere to the following requirements for all beach-related activities during marine turtle and shorebird nesting/breeding seasons [April 1 through October 31].

a. **Beach Maintenance.**

i. The Permittee shall require their contractor, and protected species monitors to inspect all work areas that have excavations and temporary alterations of beach topography each day, to determine which areas have deviations (such as

depressions, ruts, holes and vehicle tracks) capable of trapping flightless shorebird chicks or marine turtle hatchlings. If so, the deviations outside of the active fill placement area – (see Specific Condition 23) shall be filled or leveled from the natural beach profile prior to 9:00 p.m. each day. The beach surface shall also be inspected subsequent to completion of the project, and all tracks, mounds, ridges or impressions, etc. left by construction equipment on the beach shall be smoothed and leveled.

ii. All debris, including derelict construction or coastal armoring material, concrete and metal, found on the beach placement site, shall be removed from the beach to the maximum extent practicable prior to any placement of fill material. If debris removal activities will take place during protected species nesting seasons, the work shall be conducted during daylight hours only and shall not commence until completion of daily monitoring surveys.

b. **Equipment Storage and Placement.** Staging areas and temporary storage for construction equipment and pipes shall be located off the beach to the maximum extent practicable. Nighttime storage of construction equipment that is not in use shall be located off the beach. If staging and storage areas off the beach are not possible, then additional marine turtle and shorebird protective measures shall be implemented. Such protective measures shall be determined in coordination with the Department and the FWC prior to beginning of construction.

c. **Beach Driving.** All vehicles operated on the beach shall operate in accordance with the FWC's Best Management Practices for Operating Vehicles on the Beach (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/). Specifically, the vehicle shall be operated at speeds less than 6 mph and run at or below the high-tide line. All personnel associated with the project shall be instructed about the potential presence of protected species, and the need to avoid injury and disturbance to these species. *Note: when flightless chicks are present within or adjacent to travel corridors, construction-related vehicles shall not be driven through the corridor unless a Bird Monitor is present pursuant to Specific Condition 23.*

14. **Marine Turtle Protection Conditions.**
Construction-related activities are authorized to occur on the nesting beach (sandy beach seaward of existing coastal armoring structures or dune crest and all areas used for beach access), commencing after October 31 and completed before May 1, which is outside of the main part of marine turtle nesting season (May 1 through October 31). Construction-related activities may occur during the early nesting season (March 1 through May 1) and late nesting season, (November 1 through November 30) under the following conditions:

a. Daily early morning marine turtle nest surveys shall start at the beginning of marine turtle nesting season (March 1) or 65 days prior to beach placement whichever is later. Daily nesting surveys shall continue through November 30, or until two weeks after the last crawl in the project area, whichever is earlier.

b. Daily nesting surveys shall be conducted beginning ½ hour prior to sunrise, and no construction activity may commence until completion of the marine turtle survey each day.

c. The Permittee shall ensure that marine turtle nesting surveys are conducted as required in this authorization, and only conducted by personnel with a valid FWC Marine Turtle Permit, that covers all project activities as required by Chapter 68E-1, F.A.C. For information on the authorized Marine Turtle Permit Holders in the project area, contact FWC at MTP@MyFWC.com.

d. Only those nests laid in the area where sand placement will occur shall be relocated, and nest relocation shall cease after the sand placement is completed. Nests requiring relocation shall be moved no later than 9 a.m., the morning following deposition (no longer than 12 hours from the time the eggs are laid), to a nearby self-release beach site in a secure setting, where artificial lighting will not interfere with hatchling orientation. The relocation site shall be determined in conjunction with and approved by the FWC prior to nest relocations. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of beach settings that are not expected to experience any of the following: inundation by high tides; severe erosion; previous egg loss; or illumination by artificial lighting.

e. Nests deposited within areas where construction activities will not occur for 65 days, or nests laid in the nourished berm prior to tilling, shall be marked and left in place. The Marine Turtle Permit Holder shall install on- beach markers at the nest site to establish a minimum 5- foot radius around the approximate clutch location and shall also install a secondary marker at a point as far landward as possible to assure that the nest can be located should the on- beach marker be lost. No activity shall occur within the marked area, nor shall any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

f. Beginning March 1, daytime surveys shall be conducted for leatherback sea turtle nests. Nighttime surveys for leatherback marine turtles shall begin when the first leatherback crawl is recorded within the project or adjacent beach area through April 30, or until completion of the project, whichever is earliest. Nightly nesting surveys shall be conducted from 9 p.m. until 6 a.m. The project area shall be surveyed at 1-

hour intervals and eggs shall be relocated per the preceding requirements. Since leatherbacks require at least 1.5 hours to complete nesting, the 1-hour interval will ensure that all nesting leatherbacks are encountered.

15. **Fill Restrictions.** During the marine turtle nesting season, the contractor shall not advance the beach fill more than 500 feet along the shoreline between dusk and the following day, until the daily nesting survey is completed, and the beach has been cleared for fill advancement. If the 500-foot advancement limitation is not feasible for the project, an alternative distance shall be established during the preconstruction meeting, if a distance can be agreed upon in consultation with the FWC. If the work area is extended, nighttime nesting surveys are required, and a Marine Turtle Permit Holder is required to be present on-site to ensure that no nesting and hatching marine turtles are present. If any nesting turtles are sighted on the beach within the immediate construction area, activities shall cease immediately until the turtle has returned to the water and the Marine Turtle Permit Holder responsible for nest monitoring has relocated the nest.

16. **Marine Turtle or Nest Encounters.** Upon locating a dead or injured marine turtle adult, hatchling, or egg that may have been harmed or destroyed as a result of the project, the Permittee shall be responsible for notifying the FWC Wildlife Alert at 888-404-FWCC (3922). Care shall be taken in handling injured marine turtles or exposed eggs to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials for later analysis. If a marine turtle nest is excavated during construction activities, but not as part of the authorized nest relocation process outlined in these specific conditions, the permitted person responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

17. **Tilling, Compaction and Escarpment Remediation Requirements.** For the years after the first- year sand placement (out- year), compaction monitoring, tilling and escarpment monitoring are not required if placed material no longer remains on the dry beach.

    a. **Compaction Sampling.** Sand compaction shall be monitored in the area of sand placement immediately after completion of the nourishment event, and two weeks prior to the beginning of marine turtle nesting season, for three (3) subsequent years. The requirement for compaction monitoring may be eliminated if the placed sand is tilled, regardless of post- construction compaction levels. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled prior to the beginning of marine turtle nesting season. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required. Compaction monitoring shall be in accordance with the following protocol:

i. Compaction sampling stations shall be located at 500-foot intervals along the project area. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high-water line (normal wrack line).

ii. At each station, the cone penetrometer shall be pushed to depths of 6, 12 and 18 inches three times (i.e., three replicates at each depth). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports shall include all 18 values for each transect line, and the final 6 averaged compaction values.

iii. If values exceeding 500 psi are distributed throughout the project area, but in no case do those values exist at two adjacent stations at the same depth, then the Permittee shall consult with the FWC to determine if tilling is required. A request for a tilling waiver based on these compaction values shall be submitted to the FWC at MarineTurtle@MyFWC.com.

b. **Tilling Requirements.** If tilling is performed regardless of post-construction compaction levels or tilling is required based on compaction measurements, the area shall be tilled to a depth of 36 inches. Tilling shall be in accordance with the following protocol:

i. All tilling activity shall be completed prior to the marine turtle nesting season. If the project is completed during the marine turtle nesting season, tilling shall not be performed in areas where nests have been relocated to or left in place.

ii. A relatively even surface, with no deep ruts or furrows, shall be created during tilling. To do this, chain-linked fencing or other material shall be dragged over those areas as necessary after tilling. Each pass of the tilling equipment shall be overlapped to allow thorough and even tilling.

iii. Tilling shall occur landward of the wrack line and shall avoid all naturally vegetated areas that are at least 3 square feet in size, as well as any planted areas that have been authorized by the Department. A 3-foot-wide No-Tilling buffer shall be maintained around vegetated areas. The slope between the

mean high- water line and the mean low water line shall be maintained to approximate natural slopes.

c. **Escarpment Surveys.** Visual surveys for escarpments along the project area shall be made immediately after completion of sand placement, within 30 days prior to March 1 and weekly throughout the marine turtle season for three (3) subsequent years, each year placed sand remains on the dry beach. Escarpment remediation shall be as follows:

i. Prior to marine turtle nesting season, escarpments that interfere with marine turtle nesting or that exceed 18 inches in height for a distance of at least 100 feet shall be leveled to the natural beach contour or the beach profile shall be reconfigured to minimize scarp formation. Any escarpment removal shall be reported relative to R monument location to the FWC at MarineTurtle@MyFWC.com with a copy sent to the JCP Compliance Officer.

ii. If weekly surveys during the marine turtle nesting season document escarpments that exceed 18 inches in height for a distance of at least 100 feet and have persisted for more than two weeks, the FWC shall be contacted immediately to determine the appropriate action to be taken. The Permittee shall provide locations and measurements of the escarpments to the closest R monument as well as the coordinates for the location of marine turtle nests located within 20 feet of the escarpments (latitude and longitude in decimal degrees), with photographs when possible. Upon written notification by the FWC that the escarpment needs to be leveled, the Permittee shall level the escarpment. If nests are located nearby, to minimize impacts to any existing nest the Permittee shall also coordinate with the marine turtle permit holder prior to leveling the escarpments. An annual summary documenting weekly escarpment surveys (including dates, presence and height of escarpments) and any remediation actions taken shall be submitted electronically to the FWC (MarineTurtle@MyFWC.com) by December 31 of each year.

Note for Shorebird Protection: If compaction sampling, tilling or escarpment removal occurs during shorebird breeding season, the Shorebird Conditions (including surveys) included in this authorization shall be followed. No heavy equipment shall operate, and no compaction sampling or tilling shall occur within 300 feet of any shorebird nest. If flightless shorebird chicks are present within the work zone or equipment travel corridor, a Bird Monitor shall be present during the operation to ensure that no heavy equipment operates within 300 feet of the flightless young or within a site-specific corridor established per Specific Condition 23. It is the responsibility of the Permittee to ensure that their contractors avoid tilling, scarp removal or dune vegetation planting in areas where

nesting birds are present.

18. **Post-Construction Lighting Surveys.** The Permittee shall ensure that lighting surveys be conducted from the renourished berm and the following actions taken to address potential adverse impacts expected with artificial lights visible from any dry portion of the newly elevated beach. The surveys shall be conducted from the top of the foreshore slope (i.e., the seaward edge of the filled berm before it slopes into the water), facing landward. The survey shall follow standard techniques for such a survey, such as including the number and type of visible lights, location of lights, and photo documentation (see additional techniques as per the 2015 USFWS Statewide Programmatic Biological Opinion).

    a. The first survey shall be conducted between May 1 and May 15 for the first nesting season following construction. For each visible light source, the Permittee shall document that the property owners have been notified and has been provided with recommendations for correcting the light as soon as possible. Recommendations shall be in accordance with local lighting ordinances. A report summarizing all visible lights and the recommendations for correcting the light shall be forwarded to local code enforcement. If no lighting ordinances exist, the recommendations to the property owners shall be consistent with the FWC lighting guidelines, which include no lights or light sources shall be visible from the newly elevated beach. The second survey shall be conducted between July 15 and August 1 to assess any remaining visible lights requiring corrective action.

    b. A summary report of the surveys and what corrective actions or local enforcement actions have been taken shall be submitted to the FWC at MarineTurtle@MyFWC.com and copied to JCPCompliance@dep.state.fl.us by December 31 of the year in which surveys are conducted. Upon request by the FWC, the Permittee shall set up and hold a meeting with the those responsible for code enforcement (when applicable), the FWC and the USFWS to discuss the report and potential additional corrective action needed, as well as any documented marine turtle disorientations in or adjacent to the project area.

19. **Post-Construction Monitoring and Reporting Marine Turtle Protection Conditions.**

    a. For each sand placement event, reports for all required marine turtle nesting surveys shall be provided for the post construction (partial or remaining) nesting season and for two full nesting seasons post construction in accordance with the Table 1 (below). If nesting and reproductive success is less than the criteria in the table below, an additional year of monitoring and reporting may be required. If the criteria are not met, additional conditions prior to the next sand placement on this beach may be

required by the Department and the FWC.

b. Data shall be reported and summarized for the nourished areas and reference beach in accordance with Table 1 (below). Reports shall summarize all crawl activity, hatching success of a representative sampling of nests left in place (if any) by species, project name and applicable project permit numbers and dates of construction. Data on nesting activity on the nourished areas and on an equal length of beach that is not nourished shall be submitted in electronic format (Excel spreadsheets) which are available upon request from MarineTurtle@MyFWC.com. Reports shall be sent to the FWC Imperiled Species Management section at MarineTurtle@MyFWC.com and **copied to** JCPCompliance@dep.state.fl.us. All summaries should be submitted by January 15 of the following year.

Table 1. Marine Turtle Monitoring for Beach Placement of Material.

Date	**Duration**	**Variable**	**Criterion**
Nesting Success	Year of in-season construction and two entire nesting seasons post construction, with possible additional year (for a total of three years)[1 & 2]	Number of nests and non-nesting emergences by day by species	40 percent or greater
Hatching success	Year of in-season construction and one entire nesting season post construction, with possible additional year[1 & 2]	Number of hatchlings by species to hatch from egg	60 percent or greater (a statistically valid number of loggerhead and green nests, and all leatherback nests)
Emergence Success	Year of in-season construction and one entire nesting season post construction, with possible additional year[1 & 2]	Number of hatchlings by species to emerge from nest onto beach	Average must not be significantly different than the average hatching success
Disorientations	Year of in-season construction and two entire nesting seasons post construction[1]	Number of nests and/or individuals that misorient or disorient	

Nests affected by erosion or inundation	Year of construction and two years post construction if placed sand remains on the beach	Number of nests lost and/or affected, by species	
Lighting Surveys	Two in-season surveys the year following construction; First survey between May 1 and May 15 and second survey between July 15 and August 1[1]	Number, location and photographs of lights visible from nourished berm, corrective actions recommended, and notifications made	Lighting survey and possible meeting resulting with plan for reduction in lights visible from nourished berm
Compaction	Three nesting seasons beginning with the year of construction. Not required if the beach is tilled prior to nesting season[1]	Shear resistance	Less than 500 psi
Escarpment Surveys	Weekly during nesting season for three years beginning with year of construction[1]	Number of scarps 18 inches or greater extending for more than 100 feet that persist for more than 2 weeks	Successful remediation of all persistent scarps as needed
[1] If placed sand remains on the beach [2] Additional years may be required if variable does not meet criterion based on previous year			

20. **Shorebird Protection.** The term "shorebird" is used here to refer to all solitary nesting shorebirds and colonial nesting seabirds that nest on Florida's beaches. The Permittee shall adhere to the shorebird protection conditions during the shorebird breeding cycle, which includes courtship, nesting and chick-rearing. These conditions are intended to avoid direct impacts associated with the construction of the project and may not address all potential take incidental to the operation and use related to this authorization. If harm or harassment of State Threatened species cannot be avoided, the Permittee should apply

for an FWC incidental take permit prior to commencement of the activity. For permitting options and other authorizations, please refer to the Imperiled Beach Nesting Bird Conservation Measures and Permitting Guidelines: http://www.myfwc.com/IBNB.

a. Shorebird breeding season dates in Florida begin **April 1 through September 1** (note that while most species have completed the breeding cycle by September 1, flightless young may be present beyond this date and must be protected if present).

b. The term "project activities" includes operation of vehicles on the beach, movement or storage of equipment on the beach, sand placement or sand removal, and other similar activities that may harm or disturb shorebirds.

c. Any parts of the project where "project activities" on the beach take place *entirely outside the breeding season*, do not require shorebird surveys. If project activities occur during the breeding season, bird survey routes must be established and monitored daily throughout the entire breeding season in any parts of the project area where: 1) potential shorebird breeding habitat occurs, and 2) project activities are expected to occur at any time within the breeding season. Breeding season surveys for detection and reporting of breeding behavior, nests, and young shall begin on the first day of the breeding season or 10 days prior to project commencement (including survey activities and other pre-construction presence on the beach), whichever is later. If project activities are temporarily paused during the breeding season, shorebird monitoring shall continue weekly during the pause and daily shorebird monitoring shall resume at least 10 days before project activities recommence.

d. Bird surveys shall be conducted in all potential beach-nesting bird habitats within the project boundaries that may be impacted by construction or pre-construction activities. One or more shorebird survey route(s) shall be established by the Permittee to cover project areas which require shorebird surveys. These routes shall be determined in coordination with the FWC Regional Shorebird Contact (https://myfwc.com/conservation/you-conserve/wildlife/shorebirds/contacts/) and established in the Florida Shorebird Database website (FSD) prior to the initiation of breeding season surveys. Routes shall not be modified without prior notification to the FWC Regional Shorebird Contact.

e. The Permittee shall ensure that breeding season surveys are completed **on a daily basis** by a qualified bird monitor. Surveys shall be completed prior to movement of equipment, operation of vehicles, or other activities that could potentially disrupt breeding behavior or cause harm to birds, eggs or young. If all project activities are completed and all personnel and equipment have been removed from the beach prior to the end of the breeding season, route surveys shall continue to be conducted at least

weekly through the end of the breeding season. If breeding or nesting behavior is confirmed by the presence of a scrape, eggs or young, the Permittee (or their designee) shall establish a 300-foot buffer around the site and shall notify the FWC Regional Shorebird Contact within 24 hours. **Smaller, site-specific buffers may be established if approved in writing by the FWC Regional Shorebird Contact.** The posts and materials for the shorebird buffer zones shall be removed once all breeding or nesting behavior has ceased.

f. Within 1 week prior to commencement of shorebird monitoring, the Permittee shall ensure the Bird Monitor conducts a shorebird education and identification program (and/or provides educational materials) for all on-site staff to ensure protection of nests and flightless chicks. All personnel are responsible for watching for shorebirds, nests, eggs and chicks. If the Bird Monitor finds that shorebirds are breeding within the project area, the Permittee shall place and maintain a bulletin board in the construction staging area with the location map of the construction site showing the bird breeding areas and a warning, clearly visible, stating that "NESTING BIRDS ARE PROTECTED BY LAW INCLUDING THE FLORIDA ENDANGERED AND THREATENED SPECIES ACT AND THE STATE and FEDERAL MIGRATORY BIRD ACTS".

g. Deterrents and other actions which prevent shorebirds from nesting or disturb shorebird nesting and brood-rearing behavior are prohibited without authorization from FWC. For permitting options and other authorizations, please refer to the Imperiled Beach Nesting Bird Conservation Measures and Permitting Guidelines: http://www.myfwc.com/IBNB.

21. **Shorebird Monitor Requirements.**

a. The Permittee shall ensure that nesting and breeding shorebird surveys are conducted by trained, dedicated individuals (Bird Monitors) with proven shorebird identification skills and avian survey experience.

b. Bird Monitor(s) shall be familiar with the *Breeding Bird Protocol for Florida's Shorebirds and Seabirds* and conduct all surveys using this protocol. Furthermore, Bird Monitors shall use data entry procedures outlined in the Florida Shorebird Database website. Information on these data collection and data entry protocols can be found at http://www.flshorebirddatabase.org/.

c. The Permittee shall submit a list of proposed Bird Monitors, with their contact information and a resume for each monitor which summarizes their qualifications to the FWC Regional Shorebird Contact and JCPCompliance@dep.state.fl.us, at least

14 days prior to any project activity or shorebird surveys. The FWC Regional Shorebird Contact will review Bird Monitor resumes and notify the Permittee as to which individuals meet the required qualifications and are approved. Once approved by the FWC Regional Shorebird Contact, the Permittee shall submit the names and contact information of the Bird Monitor(s) who have been approved to JCPCompliance@dep.state.fl.us prior to the start of project activities and prior to conducting shorebird surveys.

i. Approved bird monitors must attend pre-construction meetings (see Under Specific Condition 5eii Pre-Construction Conference, previously referenced in this permit).

ii. If modifications to the approved bird monitors for a project are needed, the Permittee shall notify the FWC Regional Shorebird Contact and JCPCompliance@dep.state.fl.us immediately.

- New bird monitor contact information and resumes must be submitted to the FWC Regional Shorebird Contact at least 7 days prior to conducting surveys. Monitors must be approved by the FWC Regional Shorebird Contact prior to conducting surveys through the process described in 21c above. Approved new monitors shall be submitted to JCPCompliance@dep.state.fl.us.

- New bird monitors shall overlap with the established bird monitor for a period of at least 2 days to ensure they are familiar with current shorebird breeding activity along the survey route(s) and are set up to continue data entry into the FSD.

d. The Bird Monitor(s) shall meet the following minimum qualifications:

i. Has previously participated in beach-nesting shorebird surveys in Florida. Experience with previous projects must document the ability to: 1) identify all species of beach-nesting birds by sight and sound, 2) identify breeding/territorial behaviors, and find nests of shorebirds that occur in the project area, and 3) identify habitats preferred by shorebirds nesting in the project area.

ii. Have a clear working knowledge of, and adhere to, the Breeding Bird Protocol for Florida's Seabirds and Shorebirds available at https://app.myfwc.com/crossdoi/shorebirds/PDF-files/BreedingBirdProtocol.pdf

iii. Have completed full-length webinars on Route- Surveyor Training, including the annual refresher training. Training resources available at https://app.myfwc.com/crossdoi/shorebirds/resources.aspx

iv. Ability to adhere to FWC's Best Management Practices for Operating Vehicles on the Beach available at https://myfwc.com/conservation/you-conserve/wildlife/beach-driving/

v. Experience posting beach-nesting bird sites, consistent with Florida Shorebird Alliance (FSA) Guidelines for Posting Shorebird and Seabird Sites in Florida and these permit conditions (https://flshorebirdalliance.org/).

vi. Has registered as a contributor to the Florida Shorebird Database.

22. **Shorebird Survey Protocols.** Bird survey protocols, including downloadable field data sheets, are available at https://app.myfwc.com/crossdoi/shorebirds/resources.aspx. The Permittee shall ensure all daily route surveys are reported to the FSD website within one week of data collection. The Permittee shall ensure that the Bird Monitors use the following survey protocols:

a. Surveys shall be conducted by walking the length of all survey routes and visually surveying for the presence of shorebirds exhibiting breeding behavior, shorebird chicks or shorebird juveniles, as outlined in the FSD Breeding Bird Protocol for Shorebirds and Seabirds. Use of binoculars (minimum 8x40) is required, and use of a spotting scope may be necessary to accurately survey the area. If an ATV or other vehicle is needed to cover large survey routes, the Bird Monitor shall stop at intervals of no greater than 600 feet to visually inspect for breeding activity.

b. Once breeding or nesting behavior is identified (e.g. nest scrapes present, territorial behavior, incubation, brooding, brood rearing, presence of active nests, presence of young), the Permittee shall ensure the FWC Regional Shorebird Contact is notified within 24 hours.

23. **Shorebird Buffer Zones, Travel Corridors and Protection of Nests and Young.** The Permittee shall require the Bird Monitor(s) and Contractor(s) to meet the following:

a. The Bird Monitor(s) shall immediately establish a disturbance-free buffer zone around any location within the project area where the Bird Monitor has observed shorebirds engaged in breeding behavior, including territory defense. A 300-foot buffer shall be established around each nest or around the perimeter of each colonial

nesting area. A 300-foot buffer shall also be placed around the perimeter of areas where shorebirds are seen engaging in breeding behavior including digging nest scrapes or defending nest territories. All construction activities, movement of vehicles, stockpiling of equipment, and pedestrian traffic are prohibited in the buffer zone. **Smaller, site-specific buffers may be established if approved in writing by the FWC Regional Shorebird Contact.** Travel corridors shall be designated and marked outside the buffer areas for pedestrian, equipment, or vehicular traffic.

b. The Bird Monitor(s) shall keep breeding sites under sufficient surveillance to determine if birds appear agitated or disturbed by construction or other activities in adjacent areas. If birds appear to be agitated or disturbed by these activities, then the Bird Monitor(s) shall immediately widen the buffer zone to a sufficient size to protect breeding birds.

c. The Bird Monitor(s) shall ensure that reasonable and traditional pedestrian access is not blocked in situations where breeding birds will tolerate pedestrian traffic. This is generally the case with lateral movement of beach-goers walking parallel to the beach at or below the highest tide line. Pedestrian traffic may also be allowed when breeding was initiated within 300 feet of an established beach access pathway. The Bird Monitor(s) shall work with the FWC Regional Shorebird Contact to determine if pedestrian access can be accommodated without compromising nesting success. These site-specific buffers must be approved by the FWC Regional Shorebird Contact in writing.

d. The Bird Monitor(s) shall ensure that the perimeters of designated buffer zones are marked in accordance with these shorebird conditions and FSA Guidelines for Posting Shorebird and Seabird Sites in Florida available at https://flshorebirdalliance.org. The Permittee shall ensure buffer zones are marked with posts, twine, flagging and the FWC-approved signs stating "Do Not Enter, Important Nesting Area" (see example "Do Not Enter" sign at https://flshorebirdalliance.org/resources/signs/). Posts shall not exceed 4 feet in height once installed. Symbolic fencing (twine, string or rope) should be placed between all posts at least 3 feet above the ground and rendered clearly visible to pedestrians. If pedestrian pathway and/or equipment travel corridor modifications are approved by the FWC Regional Shorebird Contact, these shall be clearly marked. **Posting shall be maintained in good repair until no active nests, eggs, or flightless young are present.** Although solitary or colonial nesters may leave the buffer zone temporarily with their chicks, the posted area continues to provide a potential refuge for the family until breeding is complete. Breeding is not considered complete until all chicks have fledged.

e. The Permittee shall ensure that no construction activities, pedestrians, moving vehicles, or stockpiled equipment are allowed within the buffer area.

f. The Permittee shall ensure that the Bird Monitor(s) designates and mark travel corridors outside the buffer areas so as not to cause disturbance to breeding birds. Heavy equipment, other vehicles, or pedestrians may transit past breeding areas in these corridors. However, other activities such as stopping or turning heavy equipment and vehicles shall be prohibited within the designated travel corridors adjacent to the breeding site.

g. When flightless chicks are present within or adjacent to travel corridors, construction-related vehicles shall not be driven through the corridor unless a Bird Monitor is present to adequately monitor the travel corridor. The Permittee shall require the contractor with the oversight of the Bird Monitor(s) to avoid any chicks that may be in the path of moving vehicles. The Permittee shall also require the contractor with the oversight of the Bird Monitor(s) to level any tracks, ruts, or holes that may be capable of trapping flightless chicks, while avoiding any impacts to the chicks.

h. Any injury or death of a shorebird (including crushing eggs or young) resulting from project activities shall be reported in writing within 24 hours to the FWC Regional Shorebird Contact.

MONITORING REQUIRED - TURBIDITY:

24. Water Quality - Turbidity shall be monitored as follows:

During placement of stockpiled sand into the portions of the fill template that are on dry beach ONLY, visual turbidity monitoring may be employed. For all other fill activities authorized under this permit, physical turbidity monitoring shall be employed.

Visual Turbidity Monitoring:

The Permittee shall have a person with experience in turbidity monitoring on site to visually monitor for any project-related turbidity plumes during all construction activities where no in-water work or placement is occurring. The person conducting the visual turbidity monitoring shall maintain a log of at least three (3) regular observations approximately 4 hours apart, as well as an observation at any other time during construction that a turbidity plume is observed. Should a turbidity plume be generated by any construction activity, the occurrence shall be noted in a log and a visual assessment shall be made to determine if the turbidity within 50-meter radius from construction activities, could potentially be greater than 29 NTUs above background.

If a turbidity plume, visually assessed as potentially greater than 29 NTUs above background extends more than 50-meters from the source of turbidity, turbidity shall be physically measured at the edge of the 150-meter mixing zone, or at the edge of the nearest unmitigated hardbottom, whichever is closer in accordance with the physical turbidity monitoring protocol listed below. If physical monitoring reveals turbidity levels that are greater than 29 NTUs above the corresponding background turbidity levels, construction activities shall **cease immediately** and the Permittee shall follow the protocol outlined in specific condition 25. The occurrence shall be noted in the log and the Permittee shall notify the JCP Compliance Officer within 24 hours. If turbidity plumes visually assessed as potentially greater than 29 NTUs above background, routinely extend more than 50 meters from the source, the Permittee shall revert to physical monitoring.

If the visually assessed turbidity plumes no longer extend beyond 50 meters, the JCP Compliance Officer may approve the re-initiation of visual monitoring. A weekly log visual turbidity monitoring (including any physical samples) shall be submitted.

Physical Turbidity Monitoring:

Units: Nephelometric Turbidity Units (NTUs).

Frequency: Monitoring for in water fill placement shall be conducted 3 times daily, approximately 4 hours apart, and at any other time that there is a likelihood of an exceedance of the turbidity standard, during all in water sand placement operations.

Sampling shall be conducted **while the highest project-related turbidity levels are crossing the edge of the mixing zone**. The compliance samples and the corresponding background samples shall be collected at approximately the same time, i.e., background sample shall immediately follow the compliance sample.

Location: *Background*: Sampling shall occur at surface (approximately one foot below the surface), mid-depth (for sites with depths greater than 6 feet), and bottom (approximately 6 feet above the bottom for sites with depths greater than 25 feet). All background sampling shall occur clearly outside the influence of any artificially generated turbidity plume or the influence of an outgoing inlet plume.

Beach Site: Samples shall be collected at least 500 meters up-current from any portion of the beach that has been, or is being, filled during the current construction event, at the same distances offshore as the associated compliance samples.

Compliance: Sampling shall occur at surface (approximately one foot below the surface), mid-depth (for sites with depths greater than 6 feet), and bottom (approximately 6 feet above the bottom for sites with depths greater than 25 feet).

Beach Site: Samples shall be collected where the densest portion of the turbidity plume crosses the edge of the mixing zone polygon, which measures up to 150 meters offshore and up to 1000 meters alongshore from the source of turbidity or at the edge of the nearest hardbottom, whichever is closer. *Note: If the plume flows parallel to the shoreline, the densest portion of the plume may be close to shore, in shallow water. In that case, it may be necessary to access the sampling location from the shore, in water that is too shallow for a boat.*

Calibration and Verification: The instruments used to measure turbidity shall be fully calibrated with primary standards within one month of the commencement of the project, and at least once a month throughout the project. Calibration shall be verified each morning prior to use, after each time the instrument is turned on, and after field sampling using two secondary turbidity "standards" that bracket the anticipated turbidity samples. If the post-sampling calibration verification value deviates more than 8% from the previous calibration value, results shall be reported as estimated and a description of the problem shall be included in the field notes.

Analysis of turbidity samples shall be performed in compliance with DEP-SOP-001/01 FT 1600 Field Measurement of Turbidity:
http://publicfiles.dep.state.fl.us/dear/sas/sopdoc/2008sops/ft1600.pdf

If the turbidity monitoring protocol specified above prevents the collection of accurate data, the person in charge of the turbidity monitoring shall contact the JCP Compliance Officer to establish a more appropriate protocol. Once approved in writing by the Department, the new protocol shall be implemented through an administrative permit modification.

25. The **compliance** locations given above shall be considered the limits of the temporary mixing zone for turbidity allowed during construction. If monitoring reveals turbidity levels at the **compliance** sites that are greater than 29 NTUs above the corresponding background turbidity levels, construction activities shall **cease immediately** and not resume until corrective measures have been taken and turbidity has returned to acceptable levels. Any such occurrence shall also be immediately reported to the JCP Compliance Officer via email at JCPCompliance@dep.state.fl.us and include in the subject line, "TURBIDITY EXCEEDANCE", and the Project Name and Permit Number. Also notify the Department's Southeast District office.

Any project-associated turbidity source other than dredging or fill placement for beach nourishment (e.g., scow or pipeline leakage) shall be monitored as close to the source as possible. If the turbidity level exceeds 29 NTUs above background, the construction activities related to the exceedance shall **cease immediately** and not resume until corrective measures have been taken and turbidity has returned to acceptable levels. This turbidity monitoring shall continue every hour until background turbidity levels are restored or until otherwise directed by the Department. The Permittee shall notify the Department, by separate email to the JCP Compliance Officer, of such an event within 24 hours of the time the Permittee first becomes aware of the discharge. The subject line of the email shall state "OTHER PROJECT-ASSOCIATED DISCHARGE, TURBIDITY EXCEEDANCE".

a. When reporting a turbidity exceedance, the following information shall also be included:

i. the Project Name;

ii. the Permit Number;

iii. location and level (NTUs above background) of the turbidity exceedance;

iv. the time and date that the exceedance occurred; and

v. the time and date that construction ceased.

b. Prior to re-commencing the construction, a report shall be emailed to the Department with the same information that was included in the "Exceedance Report", plus the following information:

i. turbidity monitoring data collected during the shutdown documenting the decline in turbidity levels and achievement of acceptable levels;

ii. corrective measures that were taken; and

iii. cause of the exceedance.

26. **Turbidity Reports:** All turbidity monitoring data shall be submitted within one week of analysis. The data shall be presented in tabular format, indicating the measured turbidity levels at the compliance sites for each depth, the corresponding background levels at each depth and the number of NTUs over background at each depth. Any exceedances of the turbidity standard (29 NTUs above background) shall be highlighted in the table. In addition to the raw and processed data, the reports shall also contain the following information:

a. time of day samples were taken;

b. dates of sampling and analysis;

c. GPS location of sample and source. *When possible, coordinates should be provided in decimal degrees with a 5 decimal level of precision (i.e., 0.00001). Please also indicate the datum*;

d. depth of water body;

e. depth of each sample;

f. antecedent weather conditions, including wind direction and velocity;

g. tidal stage and direction of flow;

h. water temperature;

i. a geo-referenced map, overlaid on an aerial photograph, indicating the sampling locations (background and compliance), location of active construction, the visible plume pattern and direction of flow. The map shall also include the boundaries of any benthic resources or OFW. A sample map shall be submitted to and reviewed by the Department prior to construction (Specific Condition 5c-iii);

j. a statement describing the methods used in collection, handling, storage and analysis of the samples;

k. a statement by the individual responsible for implementation of the sampling program concerning the authenticity, precision, limits of detection, calibration of the meter, accuracy of the data and precision of the GPS measurements; and

l. When samples cannot be collected, include an explanation in the report. If unable to collect samples due to severe weather conditions, include a copy of a current report from a reliable, independent source, such as an online weather service.

Monitoring reports shall be submitted by email to the Department's JCP Compliance Officer. In the subject line of the reports, include the Project Name, Permit Number and the dates of the monitoring interval. Failure to submit reports in a timely manner constitutes grounds for revocation of the permit. When submitting this information to the Department's JCP Compliance Officer, on the cover page to the submittal and at the top of each page, please state: **"This information is provided in partial fulfillment of the monitoring requirements in Permit No. 0436972-001-JC, for the Reach 8 Beach and Dune Restoration Project."**

MINIMIZATION, MITIGATION, AND MONITORING REQUIRED - BIOLOGICAL

27. The Permittee shall adhere to the current, Department approved **Minimization, Mitigation, and Monitoring Plan** (**MMMP**) (dated January 2025), which is herein incorporated by reference and is enforceable as part of this Specific Condition. The Permittee is responsible for ensuring that their selected environmental resource related firms are knowledgeable of all permit conditions pertaining to monitoring requirements (including the approved MMMP); not just the scope of work in the contract prepared by the Permittee/contractor. The Permittee shall acquire written approval from the Department prior to implementing any revisions to the MMMP. See the MMMP for detailed information, methods, and reporting requirements for minimization, mitigation, and monitoring activities. Other than those authorized by this permit, no impacts to benthic resources may result from the construction of this project. Any unpermitted, project-related, temporary or permanent, direct or indirect, adverse impacts to benthic resources shall be documented, and compensatory mitigation shall be completed to offset any such impacts. Impacts and mitigation may be handled through compliance and enforcement action, and the amount of mitigation may be determined by the Department using the Uniform Mitigation Assessment Method.

    a. **Qualifications.** Surveys and monitoring shall be conducted by personnel that are certified SCUBA divers, have a BS degree or higher in the study of marine biology or a comparable field, and that have scientific knowledge of local benthic marine hardbottom habitats and their flora and fauna. Personnel conducting pre-transplantation coral surveys shall have previous experience conducting such surveys, be able to accurately identify Caribbean corals and their diseases/signs of stress and be familiar with the literature cited in the MMMP (see Section 7 – works cited). Personnel performing relocation work shall have previous experience collecting, transporting, and transplanting scleractinian coral and octocoral colonies. Coral and mitigative reef monitoring shall be conducted by staff with previous experience in monitoring hardbottom communities and coral assemblages.

    b. Survey and monitoring-related reports and deliverables shall be provided as specified in the MMMP. All coral and benthic monitoring data and statistical analysis must be provided directly and concurrently from the monitoring firm to the Department, Permittees, and Consultant(s), in order to comply with the Florida Auditor General report 2014-064 and to be consistent with Section 287.057(17)(a)(1), F.S. Moreover, if a multi-disciplinary firm is contracted for engineering and benthic monitoring services or if the engineering firm subcontracts the post-construction benthic monitoring, the Permittees shall provide a plan that addresses conflicts of interest, consistent with Section 287.057(17)(a)(1), F.S. This plan shall include a description of organizational, physical, and electronic barriers that will be used to avoid potential conflicts of interest, and this plan must be approved by the Department prior to the initiation of benthic monitoring.

28. **Compensatory Mitigation – Artificial Reefs**

a. A total of 8.79 net acres of mitigative reef formed of limestone boulders shall be constructed within the two authorized sites in the nearshore waters of the Town of Palm Beach to offset direct and potential indirect, project-related impacts to 6.17 net acres of nearshore hardbottom.

b. **Pre-Construction Related**. Mitigative artificial reef shall be deployed within the boundaries of the authorized mitigation sites in areas that meet the criteria for reef placement (see Section 3.1 in the approved MMMP). To ensure this occurs, sediment depth thickness shall be measured via t-bar measurements or jet probes throughout the authorized mitigation sites immediately prior to construction to delineate specific placement areas that meet the criteria.

c. **Construction Related**. A protective 25-m (82-ft) buffer between the artificial reef and adjacent nearshore hardbottom areas shall be maintained to prevent boulders being placed on hardbottom during artificial reef construction. Survey controls and diver quality assurance review shall be implemented to ensure that boulders are deployed at each location in the configuration specified in the construction plans. A **Georeferenced Hardbottom Resource Map** reflecting the current condition of the area surrounding each reef site shall be provided to the artificial reef construction contractors prior to the start of any and all mitigation construction activities. The contractor shall upload the Georeferenced Hardbottom Resource Map onto the computer navigation system on board each vessel/barge/scow that will operate within the reef site at any point during construction. The map shall be used to determine locations in which spudding for the jack-up barge shall occur. Spudding locations shall avoid known hardbottom areas. Locations of spudding near known hardbottom areas (based on Georeferenced Hardbottom Resource Map) shall be investigated during construction. The FDEP JCP Compliance Officer shall immediately (within 24 hours) be notified after each instance in which project related impacts to hardbottom resources are detected. A detailed Impact Assessment shall also be conducted within 48 hours of detecting impacts. See Section 3.3 in the approved MMMP for impact assessment requirements and reporting. Impacted areas shall be remediated and monitored and may require mitigation and / or restoration, depending on the outcome of remediation and the scale of the impact(s).

d. **Post-Construction Related - Monitoring**.

Post-construction physical and biological monitoring is required to document the constructed net acreage of hardbottom and the community that forms on the artificial reef. These data provide the basis for determining the success of the mitigation reef in providing the net acreage of hardbottom required to offset project impacts and in developing a hardbottom community similar to that (structure, composition, and function) of the reference community. The benthic community of the 0.8-acre

artificial reef close to the project area and to the authorized mitigation sites shall serve as the reference community for the Reach 8 mitigative limestone boulder reef. Marine turtle monitoring shall also be conducted. All required monitoring and reporting are detailed in the approved MMMP.

Mitigation Success Criteria. The following mitigation success and performance criteria shall be met:

1. Net hardbottom acreage of the artificial reef shall be (at least) equal to 8.79 net acres at the immediate post-construction physical monitoring event (within six months of construction) and at the year 5 post-construction monitoring event.

2. Benthic community composition between the artificial reef and the reference community shall be 90% similar by completion of monitoring. Comparison may be at the specific, generic, or functional group level as determined by sampling requirements.

3. Benthic community structure between the artificial reef and the reference community shall be 85% similar by completion of monitoring.

If, by the year 5 post-construction monitoring event, net hardbottom acreage is found to be less than that required to compensate for direct impacts (criterion 1), then additional mitigation reef acreage shall be constructed to fulfill the mitigation requirement. If annual mitigation biological monitoring indicates that mitigation success criteria 2 and 3 (i.e., community similarity) have been achieved prior to the end of the five-year annual monitoring period, then the Permittee and/or authorized agent may request termination of this portion of mitigation monitoring. However, if, after five (5) years of biological monitoring, success criteria 2 and 3 have not been achieved, then the Permittee and/or authorized agent will meet with the FDEP to discuss the performance of the mitigation reef and a path forward to complete the mitigation requirement. This path may include the requirement to construct additional mitigation acreage. Mitigation monitoring and maintenance requirements shall remain in effect until mitigation success is achieved.

29. **Impact Minimization – Coral Colony Relocation**
To minimize impacts within the direct and indirect impact areas (within the permitted ETOF and 50 m buffer, respectively), non-ESA listed scleractinian coral and octocoral colonies greater than or equal to 10 cm in maximum dimension shall be relocated to the mitigative reef prior to construction of the initial beach project. Colonies of ESA-listed scleractinian corals have not been observed within the project area during recent surveys; nevertheless, all colonies of ESA-listed coral species (regardless of size) encountered during the relocation effort shall also be relocated to the approved receiver site. To be

eligible for relocation, scleractinian coral and octocoral colonies must show no visible signs of disease or potential disease vectors based on the presence of stress indicators documented during required pre-location coral health surveys. A post-transplantation assessment shall be conducted within one week of completion of relocation effort. Any colonies found to be unattached at this time shall be reattached. To document the success of the relocation effort, the survival and condition of relocated colonies shall be monitored (tracked over time). All required coral colony relocation surveys and activities, monitoring, and reporting are detailed in the approved MMMP.

PHYSICAL MONITORING REQUIRED:

30. The approved Monitoring Plan can be revised at any later time by written request of the Permittee and with the written approval of the Department. If subsequent to approval of the Monitoring Plan there is a request for modification of the permit, the Department may require revised or additional monitoring requirements as a condition of approval of the permit modification.

As guidance for obtaining Department approval, the plan shall generally contain the following items:

a. Topographic and bathymetric profile surveys of the beach and offshore shall be conducted prior to commencement of construction, immediately following completion of construction, and biennially thereafter beginning one or two years following completion of construction. A pre-construction survey of the project area to receive beach fill may use surveys conducted for purposes of construction bidding, contracting or construction management. The post-construction survey of the beach fill may use surveys and other information collected periodically during construction for purposes of construction management and payment. Alternatively, the post-construction survey may consist of a single beach-offshore profile survey event of the project monitoring area conducted within 60 days after completion of beach fill placement.

Thereafter, monitoring surveys shall be conducted biennially beginning approximately one year following completion of construction until the next beach nourishment event or the expiration of the project design life, whichever occurs first. The monitoring surveys shall be conducted during a spring or summer month and repeated as close as practicable during that same month of the year. If the time period between the post-construction survey and the first biennial monitoring survey is less than six months, then the Permittee may at their discretion postpone the first monitoring survey until the following spring/summer.

The monitoring area shall include profile surveys at each of the Department Reference Monuments within the bounds of the beach fill area and along at least 5,000 feet of the adjacent shoreline on both sides of the beach fill area. All work activities and deliverables for the biennial monitoring surveys shall be conducted in accordance with

the latest update of the Department's *Monitoring Standards for Beach Erosion Control Projects, Sections 01000 and 01100.*

b. Bathymetric surveys of the offshore borrow area(s) used for construction shall be conducted within 60 days following completion of construction of the project. Alternatively, the post-construction survey of the borrow area may consist of surveys and other information collected during construction for purposes of construction management.

   Survey grid lines across the borrow area(s) shall be spaced to provide sufficient detail for accurate volumetric calculations but spaced not more than a maximum of 500 feet apart, and shall extend a minimum of 500 feet beyond the boundaries of the borrow site. In all other aspects, work activities and deliverables shall be consistent with the Department's *Monitoring Standards for Beach Erosion Control Projects, Section 01200.*

c. The Permittee shall submit an engineering report and the monitoring data to the Department within 90 days following completion of the construction and each biennial monitoring survey.

   The report shall summarize and discuss the data, the performance of the beach fill project, and identify erosion and accretion patterns within the monitored area. Results shall be analyzed for patterns, trends, or changes between annual surveys and cumulatively since project construction. In addition, the report shall include a comparative review of project performance to performance expectations and identification of adverse effects attributable to the project. The report shall specifically include:

   - A record of the volume and location of all beach fill or inlet sand bypassing material placed within the project area;
   - The volume and percentage of advance nourishment lost since the last beach nourishment project as measured landward of the MHW line of the most recent survey;
   - The most recent MHW shoreline positions (ft) in comparison with the design profile at each individual monument location;
   - The MHW shoreline position changes (ft) relative to the pre-construction survey at each individual monument location for all the monitoring periods;
   - The total measured remaining volume (cy) in comparison with the total predicted remaining volume (cy) above the MHW line and above the Depth of Closure for the entire project area over the successive monitoring periods; and,

- Other shoreline position and volumetric analysis the Permittee or engineer deem useful in assessing, with quantitative measurements, the performance of the project.

The report shall include computations, tables and graphic illustrations of volumetric and shoreline position changes for the monitoring area. An appendix shall include superimposed plots of the two most recent beach profile surveys, the design profile, and pre- and post-construction beach profile at each individual monument location.

d. A digital copy of the monitoring report and a digital file of the survey data shall be submitted to the JCP Compliance Officer in Tallahassee. Failure to submit reports and data in a timely manner constitutes grounds for revocation of the permit. When submitting any monitoring information to the Department, please include a transmittal cover letter clearly labeled with the following at the top of each page: **"This monitoring information is submitted in accordance with the approved Monitoring Plan for Permit No. [XX] for the monitoring period [XX].**

31. If the Permittee is unable to complete two maintenance events within the 15-year life of the permit, the Permittee may request (prior to the expiration date of the permit), and the Department shall grant, an extension of the permit expiration date in order to allow completion of the second maintenance event. The extension would be documented through an administrative modification.

POST CONSTRUCTION CONDITIONS

32. Within 30 days after completion of authorized activities, the Permittee shall submit a notice of completion to the JCP Compliance Officer that includes the following information:

a. The permit number 0436972-001-JC and the project name Reach 8 Beach and Dune Restoration.

b. A copy of any post-construction As-Built Survey drawings required of the Contractor. If any of the completed activities differ substantially from the permitted plans, any substantial deviations shall be noted and explained.

c. A summary of the construction event (the date on which authorized activities began and the date of completion, the volume of sand placed and/or dredged as well as the source of sand and the R-monument locations for construction activities).

d. A table identifying any exceedances of turbidity standards that occurred during dredging or disposal, the probable causes of the exceedances, and corrective measures taken to reduce turbidity.

e. A table identifying any impacts to biological resources (including SAV and hardbottom communities) and, the probable causes of the impacts, and corrective measures taken.

f. A table identifying any harm or injury to threatened species, endangered species or protected species, endangered status communities, the probable causes of the take and corrective measures taken.

33. **Post-Construction Meeting.** Within 90 days following each construction activity authorized by this permit, the Permittee shall hold a post-construction conference. Attendees shall include at minimum, the Permittee, Agent, Department representative, and FWC representative.

EXECUTION AND CLERKING:

Executed in Tallahassee, Florida.
STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

_____
Gregory W. Garis.
Program Administrator
Beaches, Inlets and Ports Program
Office of Resilience and Coastal Protection

Attachment(s):

1. Approved Permit Drawings (9 pages, dated May 2023)
2. Appendix D-9a Offshore QA/QC (10 pages, dated June 2013)
3. Appendix D-9b Upland QA/QC (9 pages, dated July 2013)
4. Minimization, Mitigation, and Monitoring Plan (MMMP) (25 pages, dated February 2025)
5. Physical Monitoring Plan – Appendix D Project Specific Monitoring and Protection Conditions (58 pages, dated December 2024)

CERTIFICATE OF SERVICE
The undersigned duly designated deputy clerk hereby certifies that this permit and all attachments were sent on the filing date below.

FILING AND ACKNOWLEDGMENT
FILED, on this date, pursuant to Section 120.52, F. S., with the designated Department Clerk, receipt of which is hereby acknowledged.

T. Campbell _____ 3/6/2025___
Clerk **Date**

TOWN OF PALM BEACH

Shore Protection Board on: March 27, 2025

Section of Agenda
GROIN REHABILITATION

Agenda Title
Groin Rehabilitation

Presenter
Sara Gutekunst, Coastal Coordinator / Michael Jenkins, Ph.D., P.E., Applied Technology & Management, Inc.

ATTACHMENTS:

- **Groin Rehabilitation**

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152870

February 20, 2015

Mr. Robert Weber
Coastal Coordinator
Town of Palm Beach
951 Old Okeechobee Road, Suite A
West Palm Beach, FL 33401

Re: Town of Palm Beach
Coastal Engineering Services for Groin Rehabilitation Assistance
Task 1 – Development of Execution Plan

Dear Rob:

CB&I Coastal Planning & Engineering, Inc. (CB&I) worked closely with Town staff to set priorities and develop an execution plan for the groins within Reaches 2 through 6 of the Town. A draft of the report was submitted via email to the Town on February 18 for review and comments. The Town's comments were incorporated into the report and the final version was submitted via email yesterday.

Enclosed is one (1) hardcopy of the report for the Groin Rehabilitation Execution Plan. Please accept this submittal as fulfillment of Task 1.

If you should have any questions, please call me.

Sincerely,

Thomas P. Pierro, P.E., D.CE
Vice President
CB&I Coastal Planning & Engineering, Inc.

Please reply to: Thomas Pierro
Phone No. 561.361.3150
E-Mail: thomas.pierro@cbi.com

cc: David Swigler, P.E., CB&I

TOWN OF PALM BEACH
GROIN REHABILITATION EXECUTION PLAN

Prepared For:

Town of Palm Beach

Prepared By:

CB&I Coastal Planning & Engineering, Inc.

February 2015

TOWN OF PALM BEACH
GROIN REHABILITATION EXECUTION PLAN

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TOWN OF PALM BEACH
GROIN REHABILITATION EXECUTION PLAN

I. INTRODUCTION

The Town of Palm Beach (Town) is located on the southeast coast of Florida in Palm Beach County on Palm Beach Island. The Town's coastline has a total of 124 groins of multiple construction types that are in various states of functionality. The purpose of this execution plan is to update the groin inventory and set priorities for addressing those needing repair, rehabilitation or removal based on recent changes to beach and groin conditions.

In September 2012, CB&I Coastal Planning & Engineering, Inc. (CB&I) completed a peer review of the Town's coastal structures to consolidate findings of the previous coastal structure assessments. As part of the peer review report, an independent assessment was developed based on field observations of the coastal structures in Reaches 2-6. The evaluation provided an assessment of groin performance and the value of maintaining, modifying or improving groins as they relate to the Town's Comprehensive Coastal Management Plan.

The conceptual groin rehabilitation plan developed in 2012 established regional management goals for the maintenance of the groins and beaches throughout the Town. The plan provides a basis to facilitate incremental improvement of the coastal structures and assumes that the current nourishment programs will continue, as well as regular monitoring of the coastal structures. The recommendations of the plan to maintain the Town's coastal structures were based on maintaining stabilization of the beach and avoiding nearshore hardbottom impacts, while providing storm protection consistent with the Town's comprehensive plan.

The primary objective of this document is to describe execution strategies and priorities for a multi-year phased approach to implement the Town's groin rehabilitation plan. The plan recommendations are based on previous studies, an updated groin inventory and present areas of most immediate concern. The plan may be modified based on site condition changes, regulatory feedback and other priorities during the course of implementation.

II. STUDY AREA

The Town of Palm Beach shoreline extends from Florida Department of Environmental Protection (FDEP) monuments R-76 to R-134+120 (Figure 1) and covers approximately 12.2 miles of coastline. This area is part of Palm Beach Island, which extends approximately 15.7 miles from Lake Worth Inlet in the north to South Lake Worth Inlet in the south. For management purposes, the shoreline in the Town of Palm Beach was divided into Reaches, with start and end points referencing FDEP monument designations (ATM, 1998). These Reaches were defined considering both coastal zone features and local political boundaries. Recently, the Town redefined the boundary between Reach 7 and Reach 8 at the Lake Worth Municipal Pier. The Reach designations are shown on Figure 1. The groins described in this report are located in Reaches 2 through 6.

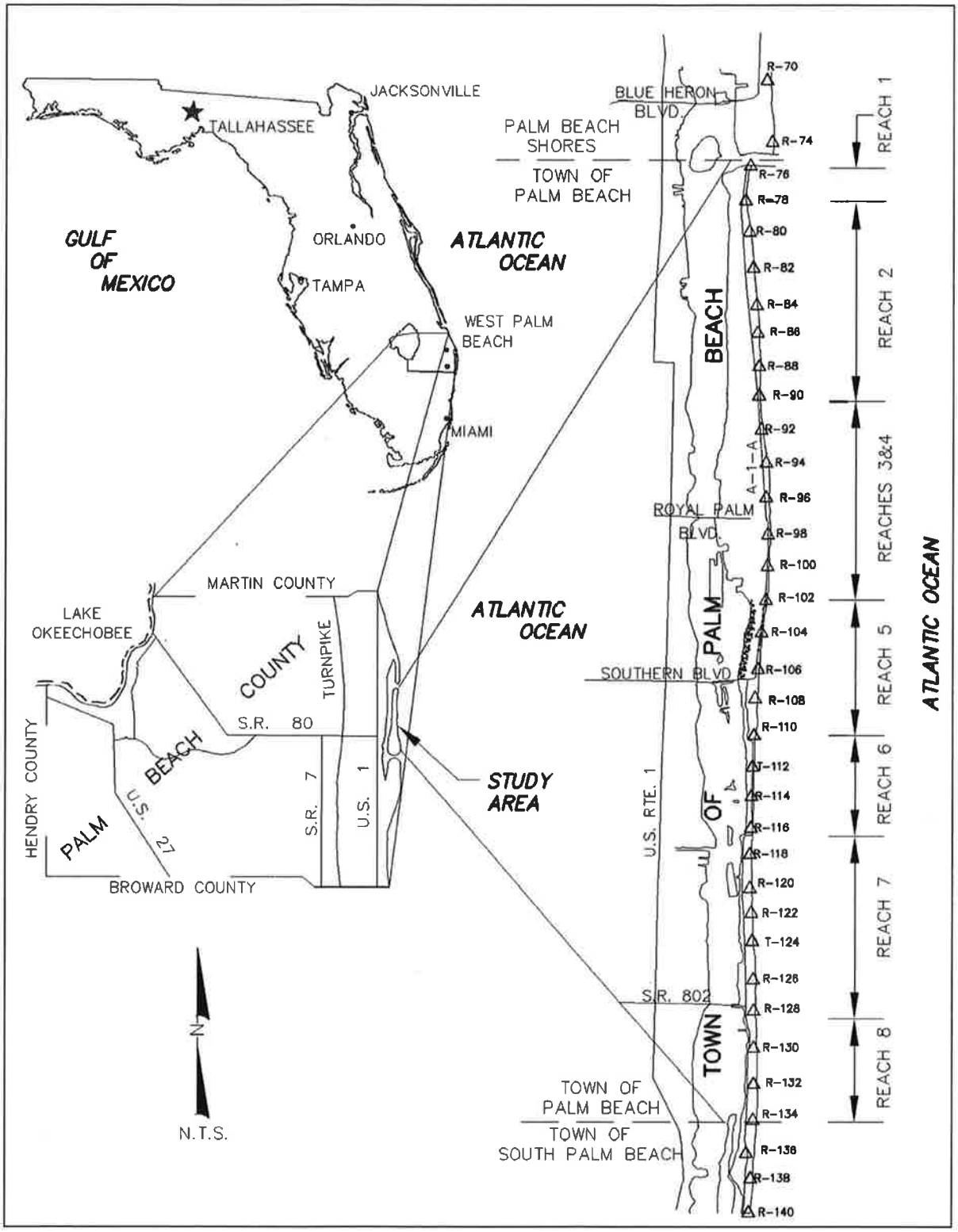


Figure 1. Location map.

III. LITERATURE REVIEW

Recent reports related to coastal structures and performance monitoring of the beaches from Reach 2 through Reach 6 serve as the basis for this planning document. The reports are primarily focused on the coastal groins within the Town limits, but also include discussion of other coastal protection measures from the perspective of how they relate to groin performance and vice-versa. The following are the primary documents that comprise this review:

1. Town of Palm Beach Groin and Armoring Inventory Isiminger & Stubbs Engineering, Inc. 2010

The objective of the I&S report was to document the existing groins and seawalls in the Town of Palm Beach. The report presents a description and summary of all the exposed groin structures and coastal armoring structures along the Atlantic Ocean shoreline within the Town of Palm Beach based on a field investigation and survey. The field work was conducted in September-November 2009.

A total of 75 groins and 95 segments of armoring (41,000 LF) were located and documented as part of the I&S study. Data for each groin was presented in a table containing a groin ID, general groin type, coordinates (northing and easting), length, elevation, size and elevation of rubble (if existent), presence of seawall, permeability, shoreline offset, localized scour, relative functionality and relative condition.

The report provides an abundance of details on most of the existing groins and seawalls, although additional groins have been exposed and located since the report was completed. The report also provides a basis for comparison and a nomenclature for groin identification that has been proven to be very useful and carried forward.

2. Coastal Structures Plan for the Town of Palm Beach Coastal Technology Corporation (2011)

The 2011 Coastal Tech report provides an assessment of the existing groins in the Town and an initial conceptual plan for the Town to address them. The assessment included field observations performed June 2010, empirical analyses and numerical modeling.

Coastal Tech analyzed each groin using historic aerial photography, shoreline and volume changes based on beach profile surveys, data in the Groin and Armoring Inventory report (Isiminger & Stubbs, 2010) and field observations. The objective was to determine the condition and function of each groin as a basis to recommend removal, repair, replacement, or to take no action, and/or add new groins in the vicinity of existing groins.

Recommendations for Reaches 2, 4 and 5 incorporated maintenance and repair as budget allows for existing groins, coupled with groin assessment at least every 5 years. The report included conceptual probable cost of construction and an assessment of permit feasibility. The resulting plan was intended to provide a partial basis for the Town to update and/or refine the Town's previously adopted Comprehensive Coastal Management Plan (CCMP) (ATM, 1998).

3. Town of Palm Beach Coastal Structures Plan Peer Review Coastal Planning & Engineering, Inc. (2012)

In 2012, Coastal Planning & Engineering, Inc. reviewed the coastal structure reports prepared by Coastal Technology Corporation and Isiminger & Stubbs Engineering, Inc., along with the Comprehensive Coastal Management Plan Update (ATM, 1998). The report consolidates findings of the previous coastal structure assessments and documents the results of field observations performed June/July 2012, which focused on the coastal groins in Reaches 2 through 6. This independent assessment described groin performance, storm protection vs. recreational benefits, the value and costs of maintaining, modifying or improving groins, most effective groin locations, and potential safety issues.

As part of the study, a conceptual Groin Rehabilitation Plan was developed to establish regional management goals for the maintenance of the groins and beaches throughout the Town. The plan facilitates incremental improvement of the coastal structures as a long-term program assuming that the current nourishment programs will continue, as well as regular monitoring of the coastal structures. The recommendations of the plan to maintain the Town's coastal structures were based on the following primary findings:

- The majority of the beaches in the Town have been stabilized by coastal groins in one form or another.
- Combined with beach nourishment and inlet bypassing, groins have contributed to wide-spread and long-term benefits for the Town's coastal program.
- Removal of the Town's groins could cause a destabilization of the coastal system that would have to be mitigated for with additional beach nourishment.
- Additional beach fill would likely be required for installation of new groins or significant modifications (improvements) to existing groins.
- Actions such as groin modifications and beach fill that result in impacts to nearshore hardbottom would require the Town to construct artificial mitigation reefs.
- Implementing groin improvements with the existing nourishment program is a feasible approach for long term coastal management in the Town.

Based on the results of the study and the findings discussed above, it was recommended that the Town pursue groin rehabilitation as a multi-year capital improvement program for implementation in phases. A preliminary conceptual plan was described in the report and included in the Beach Management Agreement developed for Palm Beach Island. Additional studies, design and engineering were recommended for implementation as part of the Town's comprehensive coastal management program. The suggested goals from the conceptual plan are presented in Table 1.

Table 1. Conceptual Groin Rehabilitation Plan (CPE, 2012).

Reach	Groin Rehabilitation Plan Goals	
Reach 1	1.1	There are no coastal structures currently managed by the Town in this Reach.
Reach 2	2.1	Leave the eight (8) groins north of R-88 in place.
	2.2	Maintain the groin field between R-88 and R-89 by leaving structures in place and repair those with damages.
	2.3	Manage the hotspot between R-89 and R-90 by removing existing unevenly spaced, deteriorated groins and repair groins at regular spacing.
Reach 3	3.1	Leave the groins in place and continue the Mid-Town nourishment projects.
Reach 4	4.1	Leave the groins along the public beach in place.
	4.2	Stabilize the beach at the south end of the public beach by constructing one groin.
	4.3	Repair the five-structure groin field in the south end of Reach 4.
	4.4	Extend the groin field into Reach 5 or manage with beach fill.
Reach 5	5.1	Repair groins to widen beach at north end of Reach 5 or manage with beach fill.
	5.2	Leave the remaining structures in Reach 5 in place.
Reach 6	6.1	Leave the structures in Reach 6 in place.
Reach 7	7.1	There are no coastal structures currently managed by the Town in this Reach.
Reach 8	8.1	There are no coastal structures currently managed by the Town in this Reach.

IV. SITE VISIT AND INVENTORY UPDATE

Site visits performed by CB&I Coastal Planning & Engineering, Inc. (CB&I) in 2012 and 2014 confirmed that the current physical condition of the majority of the previously documented structures is comparable to previous reports, with the exception of the groins at The Breakers due to the recent rehabilitation project.

In support of the execution plan development, CB&I performed site visits on July 24 and 25, 2014, in Reaches 2 through 6 to observe the groin conditions from a coastal processes standpoint and update the groins structures inventory. The current condition and effectiveness of the existing structures was observed and documented for comparison with any changes in visual condition and effectiveness since the previous field observations in June/July 2012. Observations were limited to exposed sections of the groins.

As of the 2014 site visit, there are a total of 121 groins and three (3) shore-parallel structures documented in the Town. This is an additional 28 groin structures compared to the 93 groins documented as of 2012 (CPE, 2012). The beach condition at the time of the site visits greatly influences the visibility of the groins, resulting in known groins and recently identified groins, or portions thereof, being observed at different times. The number of "Known" groins from the prior site visits (I&S, 2009; Coastal Tech, 2011; and CPE 2012) and the number of "Recently Identified" groins from 2014 are shown by Reach in Figure 2. Plan view drawings depicting the locations of the groins are included in Appendix A.

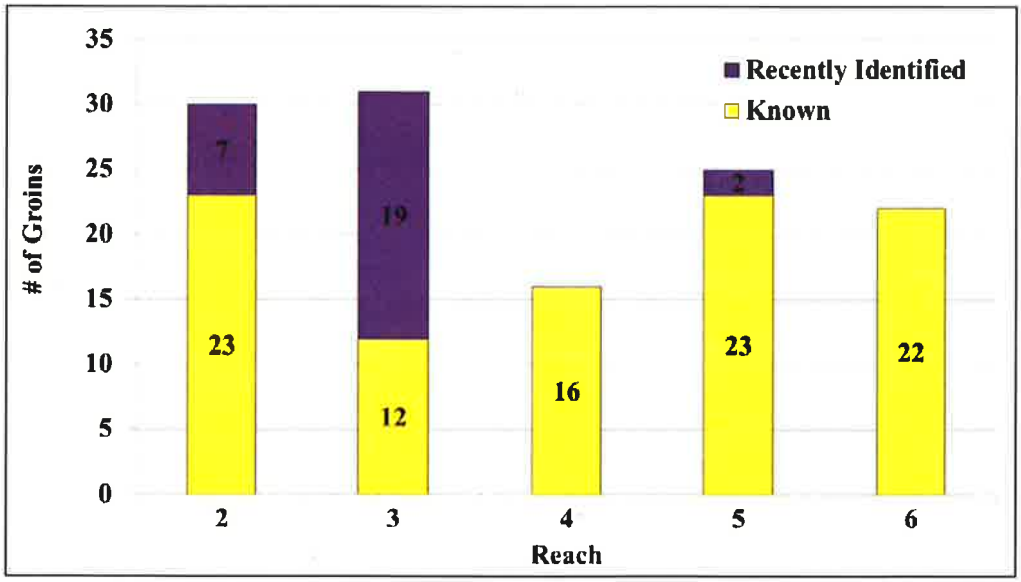


Figure 2. Number of groins by Reach as of 2014.

A site visit report, which includes observations by reach and photos (ground level and aerials) documenting the condition of the structures from 2012 to 2014, is included as Appendix B. The following findings were drawn from the 2012 and 2014 site visits:

- The structures are constructed of various materials including steel sheet pile, concrete, timber, rubble mound, steel rebar, and combinations thereof.

- The structures are constructed of various techniques including but not limited to steel sheet pile with steel waler, steel sheet pile with concrete cap, steel sheet pile with concrete core, steel sheet pile with rubble mound, timber pile & panel, and rubble mound.

- The structures are ephemeral as sand migrates alongshore resulting in periods of varying levels of exposure and burial. Not all of the documented groins were observed during each site visit. There may be additional groins that have not been documented herein.

- The dimensions and spacing of the structures vary. Their cross-shore lengths range extending up to approximately 300 feet from the existing seawalls (or dune vegetation). Their crest elevations range from approximately 2-3 feet above to 3-4 feet below the water surface. Their alongshore spacing average approximately 350 feet, but range to more than 1,000 feet.

- The conditions and effectiveness of the structures are in various states. Steel sheet piles have deteriorated becoming porous. Rubble mound stones have settled reducing the crest elevation and have been displaced increasing porosity. Timber has weathered and become dilapidated. Concrete has spalled and cracked exposing steel rebar.

- Many structures are holding sand at low beach elevations and in the water. The conditions of the structures may be causing a "salient" response vs. a "saw-tooth" pattern at the shoreline.

- The structures are functioning to varying degrees and providing benefits in fields or groups.

- Ephemeral hardbottom exists offshore of the structures. The hardbottom formations appear to be affecting shoreline response in some areas, specifically in areas where the hardbottom is close to the shoreline.

- If structures are removed, sand may be released to cross-shore and longshore transport resulting in increased erosion and hardbottom impacts.

- Seawalls, revetments, and retaining walls currently exist along a majority of the coastline. They have been constructed and repaired at various times over the years. Their level of toe protection, stability, and design life are unknown. Sand held by the structures appears to provide additional toe protection to the seawalls, revetments, and retaining walls.

- The conditions of the structures may pose potential safety hazards to the public.

The 124 groins that have been identified within Reaches 2 through 6 as of the 2014 site visit were organized into structural groups as outlined in Table 2. The groups were based on structure type and spacing, beach condition, and overall coastal setting.

Table 2. Structure Grouping.

Reach	Structure Group	Condition of Structure Group
Reach 1	R-76 of R-78+500	No coastal structures managed by the Town.
Reach 2	**2A** R-78+500 to R-87 G71208 through G74650 (14 structures)	Low crested, steel sheet pile or rubble mound groins spaced approximately 600 feet alongshore. Groins extend cross-shore between seawalls and hardbottom.
	2B R-87 to R-89 G73655 through G72800 (6 structures)	The seawalls and hardbottom diverge south R-87. The length of the groins are longer that Group 2A and the crest elevations are above high tide. The groins are constructed of steel sheet pile with concrete caps spaced approximately 300 feet alongshore. Steel sheet pile at the shoreline has deteriorated becoming porous.
	2C R-89 to R-90+400 G72663 through G71633 (10 structures)	The crest elevations are above high tide at the landward end and slope down becoming submerged during low tide at the seaward end. The groins are of mixed construction types including steel sheet pile, timber, and rubble mound spaced approximately 200 feet alongshore. Steel sheet pile at the shoreline has deteriorated becoming porous.
Reach 3	**3A** R-90+400 to R-93+500 G71208 through G67812 (24 structures)	Low crested, steel sheet pile groins spaced approximately 200 feet alongshore. Groins extend cross-shore between seawalls and hardbottom.
	3B R-93+500 to R-95 G67472 through G65583 (7 structures)	T-head groins managed by the Breakers Hotel. The structures were rehabilitated the winter of 2011/2012.
Reach 4	**4A** R-95 to R-99+500 G64334 through G61703 (11 structures)	Groins within the Mid-Town Beach Nourishment Project Area. The groins are spaced approximately 350 feet alongshore. They are comprised of Prefabricated Erosion Prevent (PEP) units overlain by 2-3 foot diameter limestone boulders.
	4B R-99+500 to R-102+300 G60352 through G58554 (5 structures)	Low crested, steel sheet pile groins spaced approximately 500 feet alongshore. Groins extend cross-shore between seawalls and hardbottom.
Reach 5	**5A** R-102+300 to R- 104+500 G57512 through G56253 (4 structures)	Low crested, steel sheet pile groins unevenly spaced alongshore (average 650 feet). Groins have deteriorated becoming porous.
	5B R-104+500 to R-107+500 G54947 through G51896 (11 structures)	Groins are uniformly spaced approximately 300 feet alongshore. The crest elevations generally slope or step-down as they extend offshore such that only the landward ends are exposed during high tide. They are constructed of concrete encased by steel sheets. The northern two groins have deteriorated becoming porous at the landward ends.
	5C R-107+500 to R-110+100 G51225 through G48688 (10 structures)	Groins are uniformly spaced approximately 300 feet alongshore. The crest elevations generally slope or step-down as they extend offshore such that only the landward ends are exposed during high tide. They are constructed of constructed of steel sheet pile, of steel sheet pile with a concrete cap, or of mixed construction materials. The groins have deteriorated becoming porous, but a dry beach is maintained throughout seasonal fluctuations.
Reach 6	**6A** R-110+100 to R-116+500 G48338 through G42198 (22 structures)	Low crested, steel sheet pile groins that are uniformly spaced approximately 300 feet alongshore. Groins in front of the FDOT revetment along SR A1A are intact and extend offshore to hardbottom. The two groins at the north end of the FDOT revetment have lower crest elevations.
Reach 7	R-116+500 to R-128+530	No coastal structures managed by the Town.
Reach 8	R-128+530 to R-134+135	No coastal structures managed by the Town.

V. IMPLEMENTATION ASSESSMENT

1. Existing Conditions

The long term trend for the coastline within Reaches 2 through 6 of the Town of Palm Beach is erosional with short term periods of accretion. The dry beach width fluctuates on a seasonal basis as sand is transported by breaking waves from north to south along the coastline. The supply of sand within the system is affected by the rate of sand naturally transported, beach and dune nourishment, and mechanical by-passing around Lake Worth Inlet at the north end of Reach 1.

Historically, groins have been constructed to manage erosional trends by slowing the transport of sand through a particular area. In the Town of Palm Beach, initial groin construction dates back to the 1930's. Since that time, many groins have been installed, repaired, rebuilt, modified, removed, and additional groins installed. The most recent rehabilitation was completed during the winter of 2011/2012 in front of the Breakers Hotel.

The approach of using groins over the years to address erosion has resulted in the installation of a variety of types in terms of construction materials, alongshore spacing, crest lengths and elevations, and levels of effectiveness. For assessment purposes, the groins were organized into structural groups with an overview of their existing conditions in Table 2.

2. Design Intent

Over the many years since installation, the conditions of the groins have deteriorated as they have reached the end of their typical service life. In these areas, the coastal system has responded accordingly and is generally characterized by narrow beaches stabilized with various combinations of structures. The intent of the execution plan is to maintain the current level of function though groin rehabilitation, while minimizing changes to coastal system. The following primary objectives have been defined to implement this design intent:

- Remove or cut down redundant and ineffective groins.
- Repair or replace effective groins to renew structural integrity.
- Enhance aesthetics and continuity with uniform construction materials.
- Decrease public safety risks by reducing hazards associated with deteriorated groins.

3. Construction Considerations

The replacement and removal of groins along the Town's coastline requires many considerations such as the physical restrictions that increase the complexity of executing the work and effect cost. Challenges associated with removing existing groins, working around other nearby structures, various construction types, and comparative costs were considered and are discussed below in general terms:

- Removal of existing groins involves dismantling the structures in their entirety, or portions thereof. The coastal setting and variable beach widths will make removal operations challenging. Portions of the structures that extend seaward of the dry beach will require work within and below the water surface and all the resulting debris must be taken off-site and disposed. The various existing construction materials present additional challenges, such as:

    - Steel sheet piles become corroded over time causing the interlocking sheets to seize. Removal typically requires splitting the sheets and vibrating them as they are lifted during extraction. Extraction may not be possible if the sheets are driven into underlying rock. In situations where sheets cannot be extracted, they are cut down to a lower elevation to reduce frequency of exposure.

    - Rubble mound structures can contain variable stones sizes that range from small armor stones to large boulders that settle, become displaced, and are buried over time. Removal requires excavating stones and lifting each stone from the structure. Stones buried deep in the beach may not be observed or removed. As the beach fluctuates, other stones may become exposed requiring removal at a later date if they pose a hazard to the coastal system or beach users.

    - Concrete loses its strength over time and internal reinforcing metal corrodes causing fracturing (spalling) of the concrete. These issues are typical of all concrete structures, but are amplified in the coastal environment. Removing concrete requires breaking the concrete into pieces that can then be lifted and removed from the structure. Once broken, removal techniques are similar to that for rubble mound stones. Similar to steel sheet piles, removal may be limited to a given (lower) elevation.

    - Timber becomes weathered and deteriorates quickly in the coastal environment. Wooden piles and connecting panels may break apart upon removal while being lifted out of place. Similar to steel sheet piles, removal may be limited to a given (lower) elevation.

- Nearby structures in proximity of the groins would need to be considered during the removal and replacement. Aside from the physical restrictions associated with accessing the work sites, vibrations from construction operations could damage seawalls, revetments, infrastructure, and upland property. Acceptable vibration levels will depend on the age, condition, design, and construction materials of the nearby structures. Vibration control and monitoring would help to reduce the potential for impacts and general disruption.

- Considering the construction types that currently exist within the Town, several replacement options are available:

- Timber Pile and Panel Groins would involve driving timber piles spaced approximately 10 feet on center. Between the piles, wooden panels would be installed. Penetration of the underlying hardbottom may be necessary to stabilize to the groin, which may require pre-drilling. The porosity of the groin may be considered ahead of time to approximate the performance of the existing structure. The limited service life of timber structures may not be practical.

- Concrete King Pile and Panel Groins would be similar to the timber pile and panel groins, except that the components would be made of precast concrete. The concrete piles and panels would be reinforced with internal steel rebar and prefabricated offsite. The piles would be installed approximately 12 feet on center with drilling and jetting techniques, connected by the concrete panels. The porosity of the groin may be controlled by the number of panels between piles to approximate the performance of the existing structure, which may be modified post-construction.

- Steel Sheet Pile Groins would require interlocking piles to be driven to a predetermined elevation. Similar to the pile and panel groins, the sheet may have to be driven into the underlying hardbottom. Like many of the existing groins, the steel will corrode and deteriorate over time. Flexibility of the structures permeability is not typical and post-construction adjustment is not likely.

- Steel Sheet Pile Groins with Concrete Cap would involve driving steel sheets as noted above along with casting a concrete cap around the top of the piles. The cap would improve the stability of the structure but adjustment is not possible.

- Steel Sheet Pile Groins with Concrete Core would involve driving parallel sets of piles and pouring concrete between the sheets to create a core. The core would aid in the stability of the structure similar to a cap and provide a form to cast the concrete onsite. Like the other related steel and concrete structures, exterior corrosion would occur and adjustment is not possible.

- Rubble Mound Groins with Marine Mattress Foundation would involve stacking armor stones in a trapezoidal shape to create a gravity supported structure. The bottom layer stones would be placed on top of a marine mattress foundation to reduce settlement of the structure. Readjustment of rubble mound structures post-construction is difficult and costly.

- Considering the various types of construction materials that are available to construct coastal groins, a general cost comparison was developed. The costs vary depending on the materials and equipment needed for installation and will be effected by location on a case by case basis. However, in order to provide a method of comparison, an approximate cost for 100 linear feet of structure of each type was estimated as shown in Table 3. The cost for removal of existing groins is highly variable due to the variety of construction types, location and lengths, and is not included in these estimates.

Table 3. Comparison of Approximate Costs.

Construction Type	Cost ($/100 LF)
Timber Pile and Panel	$100,000
Concrete King Pile and Panel	$150,000
Steel Sheet Pile	$200,000
Stee Sheet Pile with Concrete Cap	$300,000
Stee Sheet Pile with Concrete Core	$400,000
Rubble Mound with Marine Mattress Foundation	$750,000
Removal of Existing Groin	Variable

The estimated costs in Table 3 are provided for comparison purposes only. The costs for individual groins may vary significantly by location, methods and access. Mobilization is not included in the costs, but is estimated to be on the order of approximately $500,000 per construction phase.

4. Timing and Access

Construction access, mobilization of equipment and materials alongshore will be challenging due to the unique setting of the Town of Palm Beach and general expanse of coastal development. Environmental limitations, regulatory construction windows, and other permit conditions will increase the complexity of executing this multi-phased project. Considering that the work will likely overlap with times of high resident and visitor presence, public awareness will also be a critical matter. These considerations are discussed in more detail below and will likely be adapted during construction:

- Construction Access – Access to the beach is limited. The coastline is characterized by seawalls and revetments that restrict access to the beach for land based equipment. For example, twelve (12) potential land access locations were identified based on aerial photography but are irregularly spaced (in some instances 2 miles apart) and are typically narrow. While the Town has ownership or right-of-way of some access points, others will require coordination with and approval from upland owners. Water access is limited by nearshore hardbottom that exists almost continuously along the coastline. The water depths in the vicinity of these nearshore hardbottom formations may be less than 2-3 feet in many locations. Water based equipment may be needed to execute the work, but measures must be taken to avoid impacts to hardbottom resources.

- Mobilization of Equipment and Materials – Access alongshore is dependent upon the condition of the beach at the time of construction. The beach width fluctuates as sand migrates alongshore resulting in periods of time where water intercepts the seawalls. Regardless of whether the beach is accessed by land or water, the fluctuations in the beach width may restrict the ability to traverse alongshore. Traversing the beach is further complicated by the existing groins extending across the beach. Depending on the conditions at the time, groins may be exposed with limited or no sand cover for equipment to track over. The contractor's mobilization and general work plan will need

to consider these factors as they relate to equipment, delivery of materials and removal of debris.

- Easements – Access to the beach may be facilitated by obtaining easements from private property owners. If the upland owner is agreeable, a construction easement would allow the Town to pass through private lands for access and performance of the work. Coordination with owners should commence well in advance of construction so that the means and methods of accessing the work sites can be determined for planning purposes.

- Construction Windows – Construction will be restricted to the winter months (November through May) to avoid impacts to nesting sea turtles. However, the winter months coincide with nor'easter storm events and the season of high beach use by the public. The nor'easter storms can last for several days and occur one after another with less than a week between events. The elevated water levels and wave conditions coupled with a narrow dry beach can delay construction and damage construction equipment. When storms are not directly impacting local weather, the Town's beaches are heavily utilized by beach goers.

- Public Awareness – The winter months coincide with high beach usage by the Town's residents and seasonal visitors, who may be negatively affected by equipment, work areas, and noise associated with construction. An outreach program should be developed to disseminate information about the project and increase public awareness. This program could be complemented by a publically accessible website that can be updated during construction to keep residents and visitors informed on project phasing and progress.

VI. PERMITTING CONSIDERATIONS

While it is anticipated that construction will be broken into separate phases over multiple years with each phase spread over many months based on the project execution plan, the design work and permit applications should be addressed in a comprehensive manner for efficiency in processing. Depending on pre-application agency coordination, individual project approval may be required for each phase of construction. Coordination with the regulatory agencies and the resulting permit conditions will dictate the final sequencing.

- FDEP – Individual Project Approval (IPA) from the Florida Department of Environmental Protection (FDEP) will be sought under the authorization provided by the Beach Management Agreement (BMA). The IPA consists of an informal pre-application process and formal individual project review based on the submitted application. The application will include permit drawings for each structure, material selection, design and construction details, final construction plans and specifications and other related information required by FDEP per the BMA.

- USACE – The groin rehabilitations will also require a Department of the Army Permit from the U.S. Army Corps of Engineers (USACE). However, additional coordination is not expected to be required with the National Marine Fisheries Service (NMFS) and the

U.S. Fish and Wildlife Service (FWS) since the FDEP will invite their representatives to the IPA Application Review Meeting. Information will be provided by the USACE for consideration under the Nationwide 3 Permit for maintenance to existing structures or as required for the Public Notice and Biological Opinion(s), if required.

- Construction Type – There are a variety of construction types throughout the Town. However, the concrete king pile and panel groin should be considered as the primary replacement type for continuity and to balance construction costs, permeability, and durability over the next 30 years. In addition, the modular nature of the king pile and panel groin allows the structure to be adjusted and customized to resemble the size and dimensions of the groins to be replaced (Figure 3). This should be viewed favorably by the regulatory agencies and facilitate the comprehensive permitting approach.

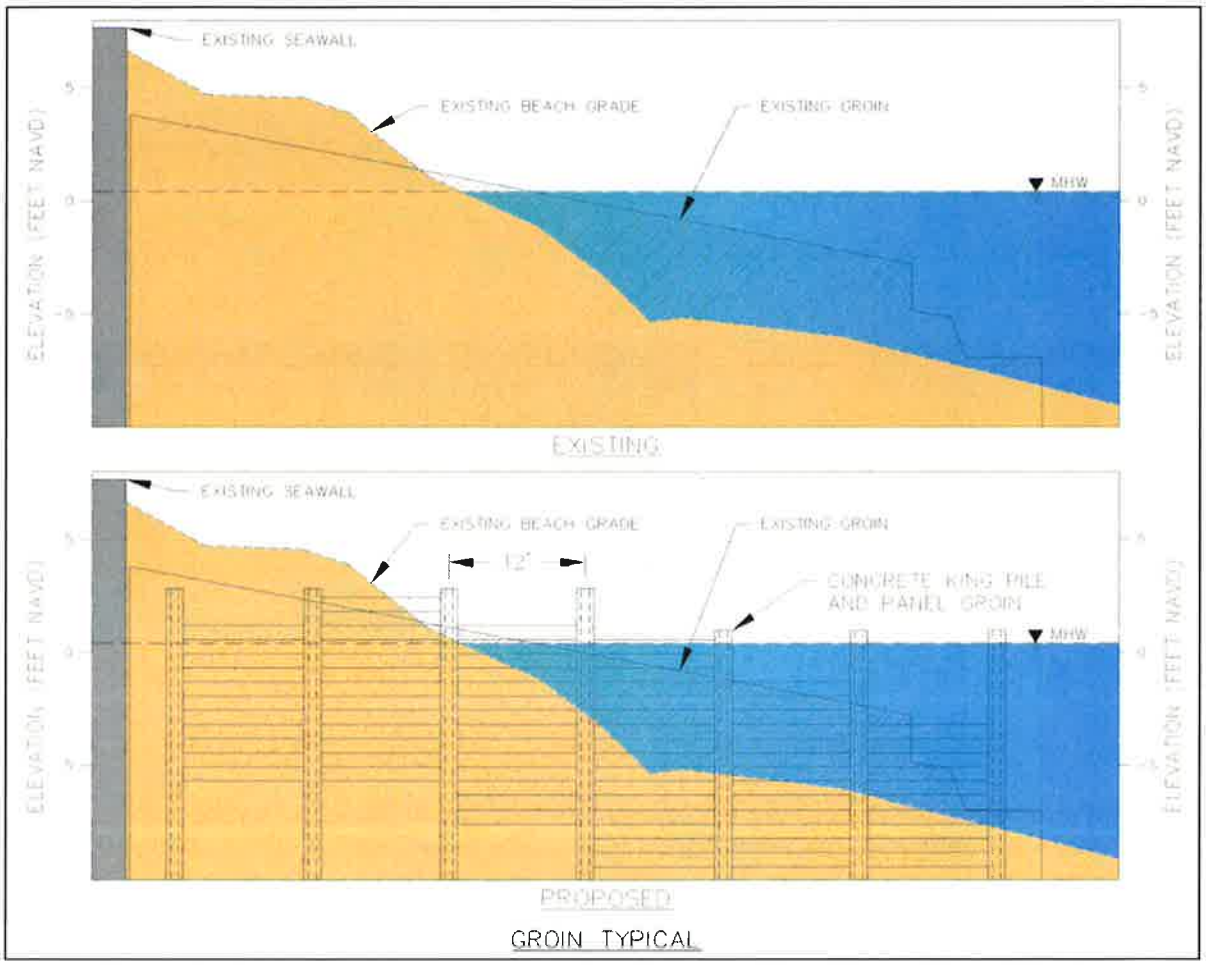


Figure 3. Conceptual Replacement with Concrete King Pile and Panel Groin.

VII. RECOMMENDATIONS

Site visits, recent reports related to coastal structures, and performance monitoring coupled with prior knowledge of the coastal system within the Town were used as a basis for the recommendations presented below.

- Maintain Current Level of Function – The existing groins have experienced various levels of deterioration. A number of the groins appear to have a minimal influence on the coastal system and may be removed to reduce safety concerns. Others are having a beneficial effect on the stabilization of sand within the coastal system. Replacing the groins will help to maintain the function that would otherwise be reduced as the groins continue to deteriorate. Groins that are replaced should be installed such that they imitate the current level of function to the extent practical.

- Improve Aesthetics – The aesthetic quality of the groins in the coastal system may be improved by consistent spacing, limiting construction types, and reconstruction of deteriorated groins. Removing groins that have a minimal influence on the coastal system will also help to establish a more uniform spacing between the groins that are more effective. The severely deteriorated groins pose potential public safety issues, which can be reduced by the removing or cutting them down. Rehabilitating the more effective groins by replacing them with concrete king pile and panel groins will improve the continuity of the groins throughout the Town.

- Implement Through Phased Construction – A phased construction approach will be necessary given the seasonal construction window that avoid impacts to nesting sea turtles. The number of phases is dependent upon the number of groins selected for action, the type of action to be taken, construction access to the project site, and mobilization alongshore. Precise timing of project phasing may not be fully known and will likely be adjusted based on the means, methods and skill of the contractor.

- Continue Beach Nourishment Program – The Town plans to complete the Mid-Town Beach Nourishment Project during winter 2014/2015. Phased construction for the groins is expected to follow the nourishment event, organized from north to south. The sand placed during the nourishment will be allowed to continue to migrate naturally and facilitate alongshore access and staging on the beach in the early phases of the work. Additional projects included in the Town's Comprehensive Coastal Management Plan will help to maintain the Town's beaches and work in unison with the groin rehabilitation program.

- Coordinate with Regulatory Agencies – The Town should use the information gathered by past studies as summarized in this document as a basis to continue coordination with the agencies to facilitate the permitting process. The coordination should occur early in the planning process to allow adequate time for consideration by the regulatory agencies and to address any potential concerns.

- Continue Physical Monitoring – It is essential to continue with the Town-wide monitoring to track sand migration year to year and over the long term. This will help identify any needs for adjustment to the groin structures and provide a basis for regulatory approvals as needed.

- Periodically Update Structure Inventory – The BMA authorizes the Town to update the list of groins every 5 years for repair, rehabilitation, or removal within Reaches 2 through 6. The list of groins included in the BMA originated from the Coastal Structures Plan for the Town of Palm Beach (Coastal Tech, 2011). The execution plan developed as part of this work should be used as the basis for the first update to the BMA.

VIII. EXECUTION PLAN

Given the limited construction access, the intent of the phases is to address groins within regions that can be completed within a single construction window. The phases comprising the execution plan are outlined below. Details including construction type, proposed action, lengths, and construction costs for each groin are presented in Appendix C

- **Phase 1 – Groups 2A, 2B, and 2C**

  Phase 1 is anticipated to be completed in the winter 2015/2016 (Year 1). It would include work performed on a total of 26 groins in Reach 2. Fifteen (15) groins would be removed and 11 would be replaced. The construction cost for Phase 1 is estimated at approximately $4.95 million.

- **Phase 2 – Group 3A**

  Phase 2 is anticipated to be completed Year 2. It would include work performed on a total of 24 groins in Reach 3. Seventeen (17) groins would be removed and seven (7) would be replaced. The construction cost for Phase 2 is estimated at approximately $4.66 million.

- **Phase 3 – Groups 4B, 5A, and 5B (northern 2 groins)**

  Phase 3 is anticipated to be completed Year 3. It would include work performed on a total of 11 groins in Reaches 4 and 5, all of which would be replaced. The construction cost for Phase 3 is estimated at approximately $3.86 million. Phase 3 may be combined with Phase 4 depending on timing and costs.

- **Phase 4 – Groups 5B (southern groin), 5C, and 6A**

  Phase 4 is anticipated to be completed Year 4. It would include work performed on a total of 14 groins in Reaches 5 and 6. Two (2) groins would be removed and 12 would be replaced. The construction cost for Phase 4 is estimated at approximately $5.59 million. Phase 4 may be combined with Phase 3 depending on timing and costs.

- **Phase 5 – Modifications (As Needed)**

  Phase 5 is anticipated to be completed Year 5 or as needed during the course of Phases 1 through 4. This work could involve old groins that have become re-exposed, removal of additional debris, adjustments to the new groins that were replaced, and other similar efforts. The construction cost for Phase 5 is entirely dependent upon the work that may be required at a given time, which is unknown at this time.

IX. SCHEDULE

The anticipated schedule of project milestones is shown in Table 4. The schedule is presented for planning purposes only. Construction and sequencing of Phases 1 through 5 will be determined by the Town during implementation of the plan.

Table 4. Anticipated Schedule.

Date	Project Milestone	Status
October 2014	Present preliminary findings from site visit to Shore Protection Board	Complete
January 2014	Obtain concurrence from Town staff on the details of the execution plan	Complete
February 2015	Submit execution plan document to the Town; Present plan to the Shore Protection Board	Ongoing
March 2015	Meet with regulatory agencies to discuss execution plan	
April 2015	Complete field investigations, surveys, designs, and cost estimates	
May 2015	Submit permit applications	
August 2015	Obtain permits; Develop construction documents	
December 2015	Commence Phase 1 construction	
Year 2	Commence Phase 2 construction	
Year 3	Commence Phase 3 construction	
Year 4	Commence Phase 4 construction	
Year 5	Commence Phase 5 construction	

Note: Phase 3 and Phase 4 may be combined and Phase 5 may start earlier as needed.

X. REFERENCES

Applied Technology & Management, Inc. (1998). Comprehensive Coastal Management Plan.

Coastal Planning & Engineering, Inc. (2012). Town of Palm Beach, Town of Palm Beach Coastal Structures Plan Peer Review.

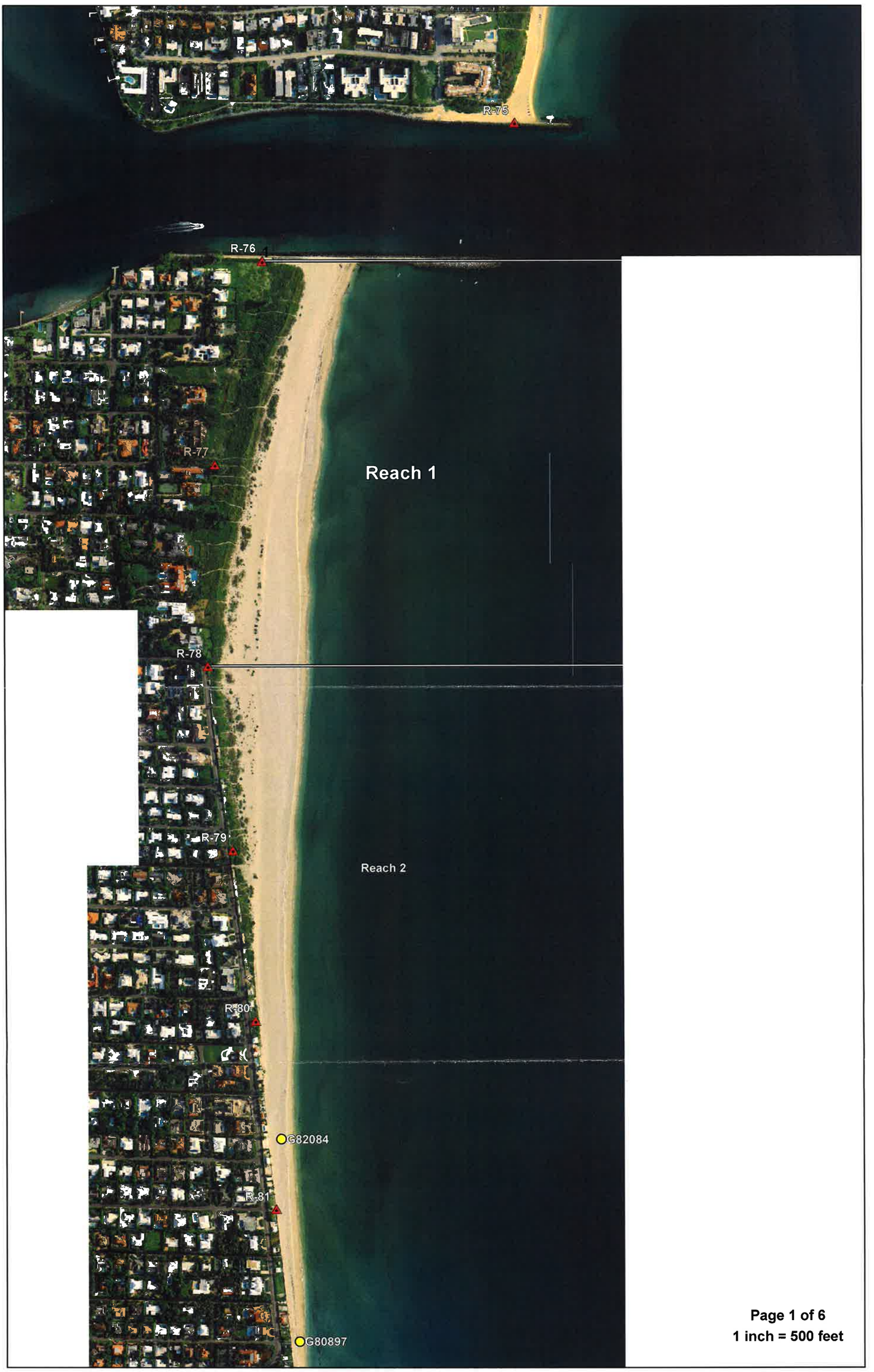
Coastal Technology Corp. (2011). Coastal Structures Plan for the Town of Palm Beach.

Florida Department of Environmental Protection (FDEP). 2013. Palm Beach Island Beach Management Agreement (BMA). http://www.dep.state.fl.us/beaches/pb-bma/docs/BMA-MainAgreement.pdf.

Isiminger & Stubbs Engineering, Inc. (2010). Town of Palm Beach Groin and Armoring Inventory.

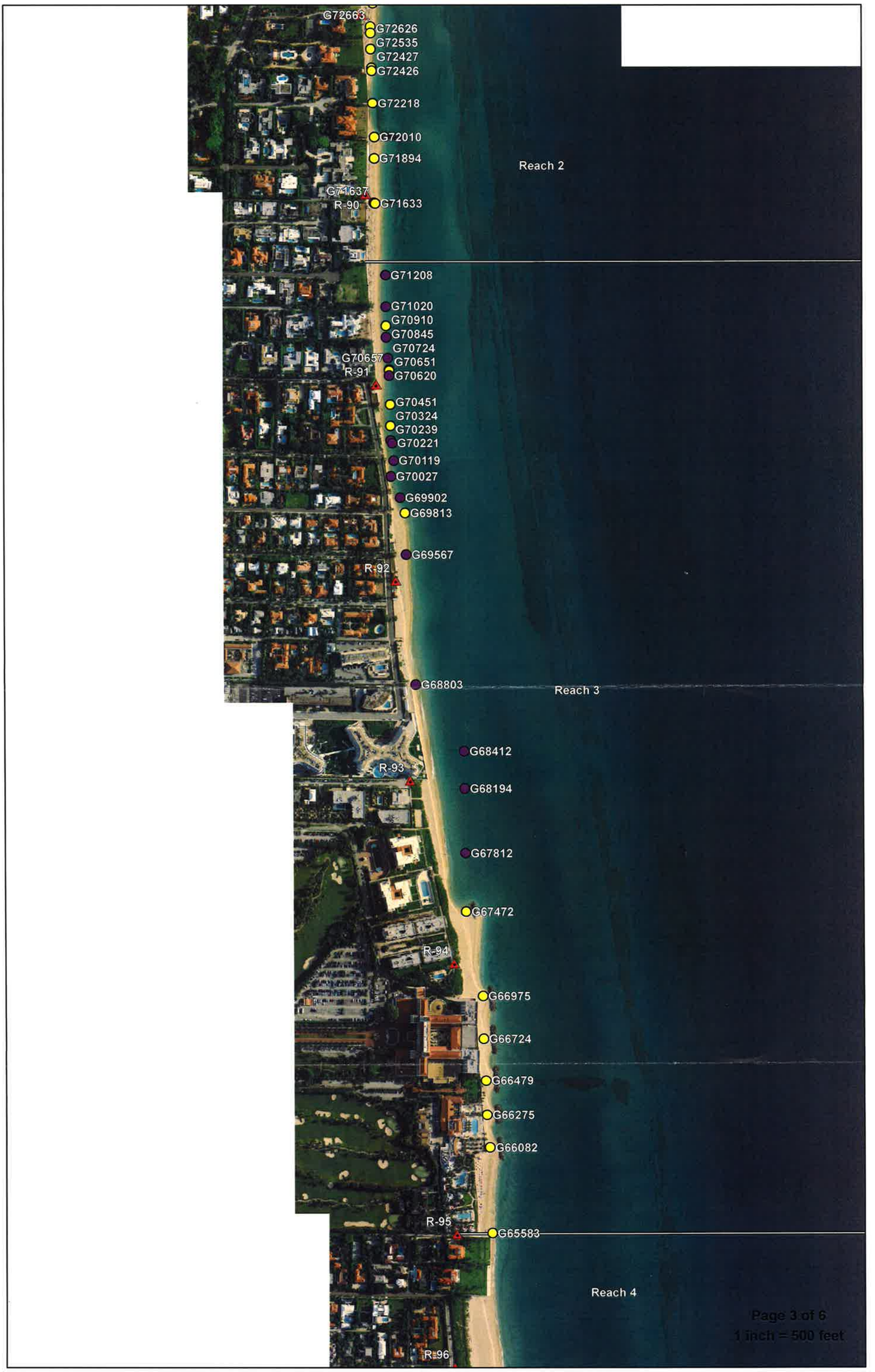
APPENDIX A

Plan Views of Groin Locations

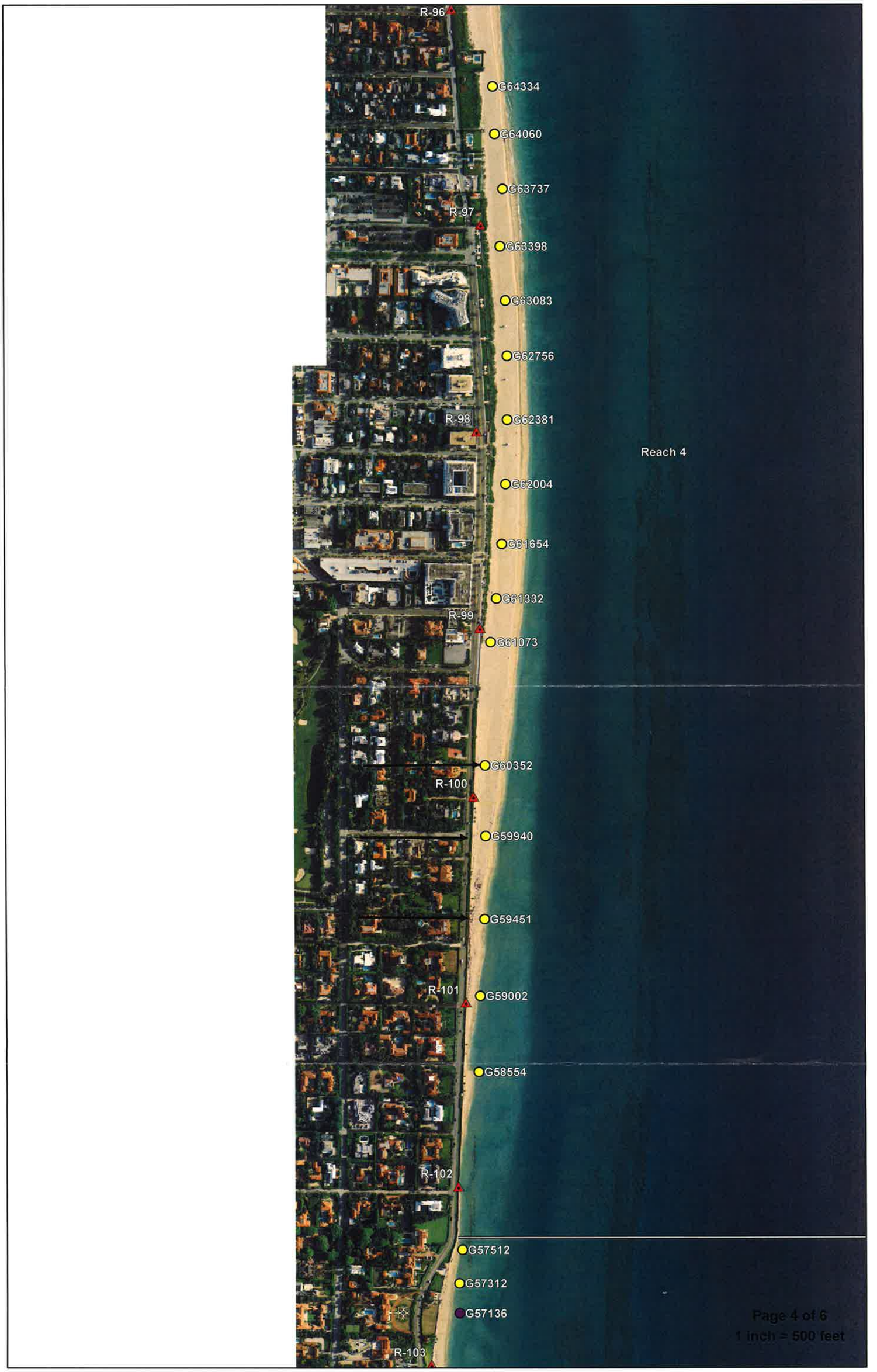


1 inch = 500 feet

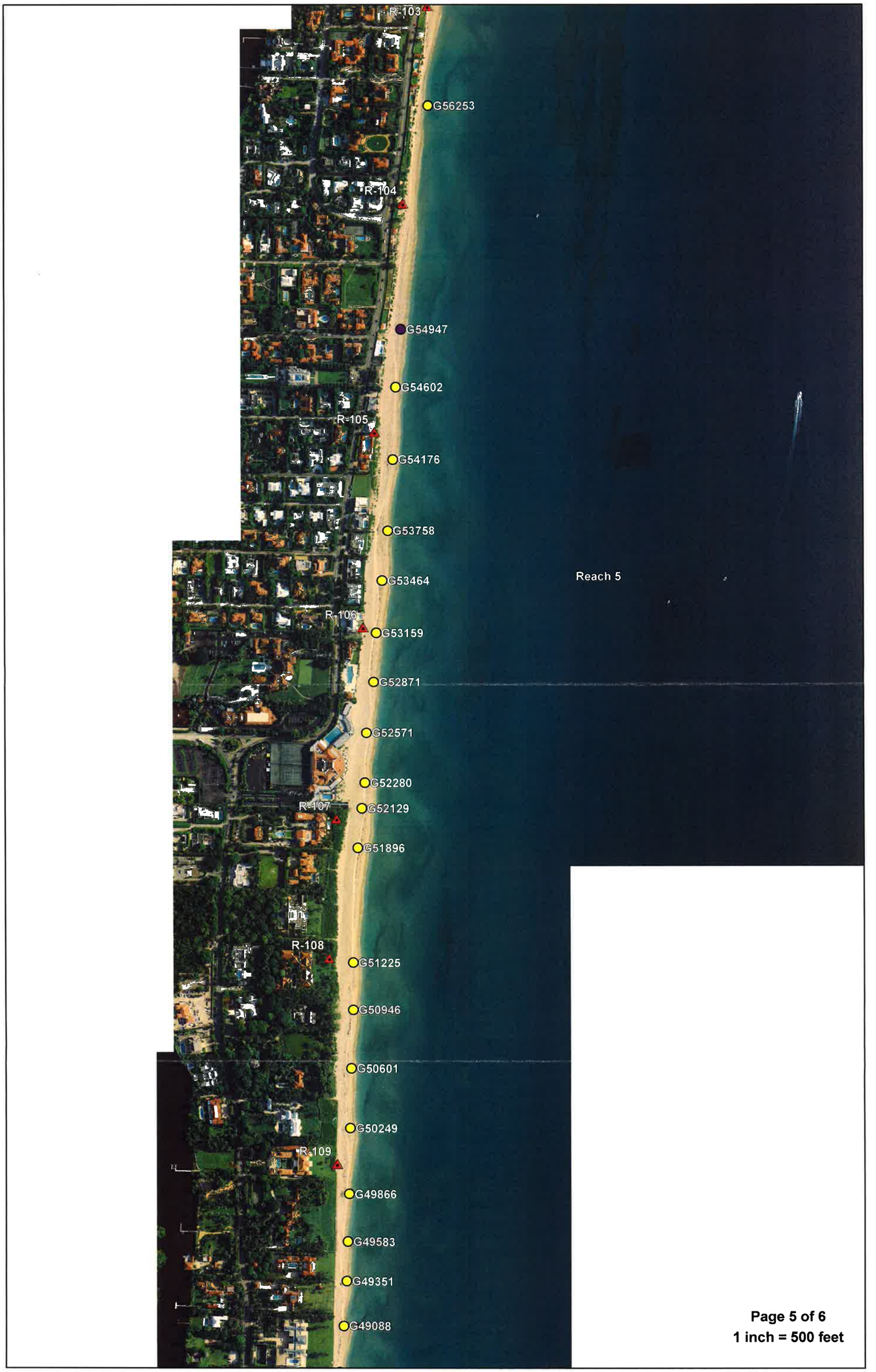
1 inch = 500 feet



1 inch = 500 feet



1 inch = 500 feet



1 inch = 500 feet

1 inch = 500 feet

APPENDIX B

Site Visit Report

TOWN OF PAM BEACH – GROIN REHABILITATION
SITE VISIT REPORT

Dates:	July 24 & 25, 2014
Project:	Groin Rehabilitation
Location:	Town of Palm Beach, Palm Beach County, FL
Attendees:	David Swigler (CB&I)

CB&I Coastal Planning & Engineering, Inc. (CB&I) performed site visits on July 24 and 25, 2014 to observe the structures in Reach 2 through Reach 6. This included documenting the construction materials, construction techniques, exposure, dimensions, and conditions of the structures. This information was compared to information collected during previous field observations by Coastal Planning & Engineering (CPE) in June/July 2012 (summer), Coastal Tech in June 2010 (summer), and Isiminger & Stubbs in September/October 2009 (fall). Observations were limited to exposed sections of the groins.

There are a total of 121 groins and 3 shore-parallel structures documented in the Town. Twenty-five (28) additional groins, excluding the 93 groins cited in the 2012 CPE report, were located during the CB&I's site visit in 2014 and identified based on aerial photography (taken June 26, 2013 and Google Earth dated January 18, 2014). The additional groins were distributed in the following reaches.

- Reach 2 – 7 groins
- Reach 3 – 19 groins
- Reach 5 – 2 groins

I. General Observations

- The structures are constructed of various materials including steel sheet pile, concrete, timber, rubble mound, steel rebar, and combinations thereof.
- The structures are constructed of various techniques including but not limited to steel sheet pile with steel waler, steel sheet pile with concrete cap, steel sheet pile with concrete core, steel sheet pile with rubble mound, timber pile & panel, and rubble mound.
- The structures are ephemeral as sand migrates alongshore resulting in periods of varying levels of exposure and burial. Not all of the documented groins were observed during each site visit. There may be additional groins that have not been documented herein.
- The dimensions and spacing of the structures vary. Their cross-shore lengths range extending up to approximately 300 feet from the existing seawalls (or dune vegetation). Their crest elevations range from approximately 2-3 feet above to 3-4 feet below the

water surface. Their alongshore spacing average approximately 350 feet, but range to more than 1,000 feet.

- The conditions and effectiveness of the structures are in various states. Steel sheet piles have deteriorated becoming porous. Rubble mound stones have settled reducing the crest elevation and have been displaced increasing porosity. Timber has weathered and become dilapidated. Concrete has spalled and cracked exposing steel rebar.

- Many structures are holding sand at low beach elevations and in the water. The conditions of the structures may be causing a "salient" response vs. a "saw-tooth" pattern at the shoreline.

- The structures are functioning to varying degrees and providing benefits in fields or groups.

- Ephemeral hardbottom exists offshore of the structures. The hardbottom formations appear to be affecting shoreline response in some areas, specifically in areas where the hardbottom is close to the shoreline.

- If structures are removed, sand may be released to cross-shore and longshore transport resulting in increased erosion and hardbottom impacts.

- Seawalls, revetments, and retaining walls currently exist along a majority of the coastline. They have been constructed and repaired at various times over the years. Their level of toe protection, stability, and design life are unknown. Sand held by the structures appears to provide additional toe protection to the seawalls, revetments, and retaining walls.

- The conditions of the structures may pose potential safety hazards to the public.

II. Observations by Reach

Below are observations made within each of the reaches during the July 2014 site visits. Attached to this report is photography organized by reach documenting each of the structures. The photographs for each structure are laid out as follows.

- Photo 1: Aerial photography taken July 26, 2013.

- Photos 2 and 3: Ground level photography taken during CPE's site visit June/July 2012.

- Photos 4 and 5: Ground level photography taken during CB&I's site visit July 2014.

a) Reach 1

There are no coastal structures currently managed by the Town in Reach 1.

b) Reach 2

There are 30 documented structures in Reach 2. Seven (7) of which had not been identified during the previous site visits since 2009. This includes G80349, G80093, G79857, G78292, G77332, G75011, and G73522.

The coastline within the reach can be divided into 3 groups based on structure type and spacing, beach condition, and overall coastal setting.

- Group 2A – North of R-87
  This includes groins G82084 south to G74650. The groins generally consist of steel sheet pile spaced an average of approximately 600 feet alongshore. The crests of the groins are near the water surface such that they are exposed at low tide and submerged at high tide. The groins extended cross-shore between existing seawalls at the landward end and hardbottom at the seaward end. This has resulted in a narrow dry beach. Seasonal fluctuations result in periods of time when there is no dry beach.

  The exception is the rubble mound groin, G74650, at the south end of the group. The crest elevation is above the water surface such that it remains exposed at high tide.

- Group 2B – R-87 to R-89
  This includes structures G73655 south to G72800. South of R-87 the hardbottom and seawalls diverge. The groins lengths are generally longer than Group 2A to extend cross-shore between these features. The crest elevations are above the water surface such that they remain exposed at high tide. The groins are constructed of steel sheet pile and concrete and spaced an average of 300 feet alongshore.

  Although the groins have deteriorated at the shoreline becoming more porous, the closer spacing has contributed a generally wider dry beach as compared to the beach within Group 2A. The offshore portions of the groins are generally intact retaining sand, which has contributed to a mildly sloped (nearly flat) offshore beach profile landward of the hardbottom.

- Group 2C – South of R-89
  This includes structures G72663 south to G71633. A shore parallel structure (G72218) constructed of sheet pile fronts the seawall of two properties. Immediately to the south, a second shore parallel structure (G71894 and G71637) approximately 300 feet in length is located approximately 200 feet offshore of the seawall. The groins within the group are of mixed construction types including steel sheet pile, timber, and rubble mound. The crest elevations generally slope or step-down as they extend offshore such that only the landward ends are exposed during high tide. The groin lengths are generally shorter that those in Group 2B, but longer that those in Group 2A. The groins have deteriorated reducing their effectiveness of retaining sand, despite the closer spacing (average less than 200 feet alongshore). These factors have contributed to a narrow beach that exposes seawalls to wave action particularly when no beach exists during seasonal fluctuations in sand movement.

c) Reach 3

There are 31 documented structures in Reach 3. Nineteen (19) of which had not been identified during the previous site visits since 2009. This includes G71208, G71020, G70845, G70724, G70657, G70620, G70239, G70221, G70119, G70027, G69902, G69567, G69329, G69097, G68939, G68803, G68412, G68194, and G67812.

The coastline within the reach can be divided into 2 groups based on structure type.

- Group 3A – North of R-93.5
  This includes groins G71208 south to G67812. The groins generally consist of steel sheet pile spaced an average of approximately 200 feet alongshore. The crests of the groins, except G69813, are below the water surface such that they are submerged at low tide. The crest elevation at the landward end of G69813 is exposed at high tide. The narrow beach and exposure of seawalls during seasonal fluctuations in sand movement experienced within Group 2C extends south though this group.

- Group 3B – South of R-93.5
  This includes structures G67472 south to G65583, which are managed by the Breakers Hotel. The structures are T-head groins consisting of steel sheet pile extending cross-shore between the seawalls and the breakwater heads at the seaward ends. The structures were rehabilitated during the winter of 2011/2012. During construction the breakwater at G66275 was added, while the T-head groin at G65538 was removed. Since construction the structures have stabilized and maintained a dry beach in front of the seawall at the Breakers Hotel. The seawall of the private residence immediately south of G65538 is frequently exposed to wave action.

d) Reach 4

There are 16 documented structures in Reach 4. No additional structures were identified.

The coastline within the reach can be divided into 2 groups based on structure type.

- Group 4A – North of R-99.5
  This includes groins within the Mid-Town Beach Nourishment Project Area, G64334 south to G61703. The groins are spaced on average approximately 350 feet alongshore with crest elevations above high tide. The groins are comprised of remnants of the Prefabricated Erosion Prevent (PEP) units from the dissembled PEP Reef that had been constructed offshore of the project area the summer of 1993. The remnants are overlain by 2-3 foot diameter limestone boulders. The groins are buried immediately following sand placement and then become exposed between nourishments. Once exposed, they act to stabilize the public beach until the next nourishment.

- Group 4B – South of R-99.5
  This includes structures G60352 south to G58554. This groin field begins approximately 700 feet south of the groins at the public beach. They are comprised of steel sheet pile

spaced on average approximately 500 feet alongshore and exhibit minimal evidence of deterioration. The crests of the groins are near the water surface such that they are exposed at low tide and submerged at high tide. The groins extended cross-shore between existing seawalls at the landward end and hardbottom at the seaward end. The beach is narrow and experiences seasonal fluctuations resulting in periods of time when there is no dry beach.

e) Reach 5

There are 25 documented structures in Reach 5. Two (2) of which had not been identified during the previous site visits since 2009. This includes G57136 and G54947.

The coastline within the reach can be divided into 3 groups based on structure spacing.

- Group 5A – North of R-104.5
  This includes structures G57512 south to G56253. The groins within the group are constructed of steel sheet pile and are unevenly spaced. The average spacing is approximately 650 feet alongshore. The crests of the groins are near the water surface such that they are exposed at low tide and submerged at high tide. The groins have deteriorated reducing their effectiveness of retaining sand. These factors have contributed to a narrow beach that exposes seawalls to wave action when no beach exists during seasonal fluctuations in sand movement.

- Group 5B – R-104.5 and R-107.5
  This includes structures G54947 south to G51896. The groins are uniformly spaced on average approximately 300 feet alongshore. The groin field appears to have stabilized the beach as evident by the wider dry beach fronting the seawalls as compared to the beach within Group 5A.

  The northern groin (G54947) is comprised of sheet pile driven between concrete blocks spaced approximately 100 feet apart. Only the blocks are exposed at low tide. The groin has deteriorated reducing their effectiveness of retaining sand.

  The next groin south (G54602) is comprised of two construction types. Landward of the water line, it appears to be a concrete pile-panel construction but the panels are not present. Seaward of the waterline is steel sheet pile. The crest of the groin is near the water surface such that it is exposed at low tide and submerged at high tide. The groin has deteriorated reducing its ability to retain sand.

  The remainder of the groins to the south appears to be intact. Although not all of the groins were visible during the June/July 2012 and July 2014 site visit, they appear to be constructed of two types. G54602 to G53464 are constructed of concrete encased by steel sheets. G53159 to G51896 are stepped concrete caisson-type structures. The crest elevations generally slope or step-down as they extend offshore such that only the landward ends are exposed during high tide.

- Group 5C – South of R-107.5
  This includes structures G51225 south to and G48688. The groin field is approximately 700 feet south of Group 5B. The groins are uniformly spaced on average approximately 300 feet alongshore. The groin field appears have stabilized the beach similar to Group 5B as evident by the wider dry beach fronting the dune vegetation and seawalls. Although the groins are effective at retaining sand, they have deteriorated.

  A majority of the groins are constructed of steel sheet pile. The piles near the water line have deteriorated increasing the porosity of the structure and reducing their ability to retain sand. Seaward of the water line the piles were generally intact. Landward of the water line the piles were intact of which 3 of the groins (G49866, G49583, and G49351) included a concrete cap.

  Two exceptions are G49088 and G48848, which are constructed of a variety of the materials. They include a steel sheet pile, concrete, timber, and rubble mound stones. The materials have deteriorated and the stones have been displaced reducing the groins' ability to retain sand.

f) Reach 6 (Group 6A)

There are 22 documented structures in Reach 6. No additional structures were identified.

This includes structures G48338 south to and G42198. The groins are uniformly spaced on average approximately 300 feet alongshore. The groins are constructed of steel sheet pile with rubble mound stone grouped at the seaward end. Hardbottom exists at the seaward end of the groins south of and including G47215. The crests of the groins are near the water surface such that they are exposed at low tide and submerged at high tide. The steel sheet pile is intact, but the stones have been displaced. The groin field appears to have stabilized and maintained a minimal dry beach in front of the seawalls and FDOT revetment along SR A1A (South Ocean Blvd.).

A shore parallel structure (A44411) constructed of steel reinforced concrete fronts the FDOT revetment between approximately R-114.1 and R-114.7. The structure is located approximately 50 feet seaward of the toe of the revetment. The crest of the structure is near the water surface such that it is exposed at low tide and submerged at high tide. Sand retention landward of the structure is subject to the seasonal fluctuation in sand movement.

g) Reach 7

There are no coastal structures currently managed by the Town in Reach 7.

h) Reach 8

There are no coastal structures currently managed by the Town in Reach 8.

OBSERVATION REPORT

REACH 2

TOWN OF PALM BEACH - GROIN REHABILITATION - REACH 2
OBSERVATION REPORT
G82084

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure condition.

Site Visit: July 2014

Photo 4. Structure centerline.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

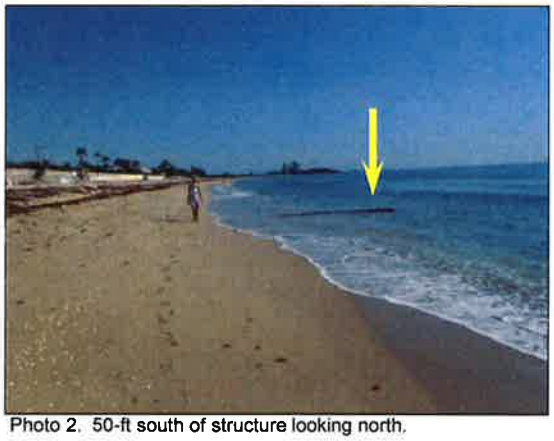


Photo 2. 50-ft south of structure looking north.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure submerged.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 100-ft north of structure looking south.

Photo 3. Structure condition.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

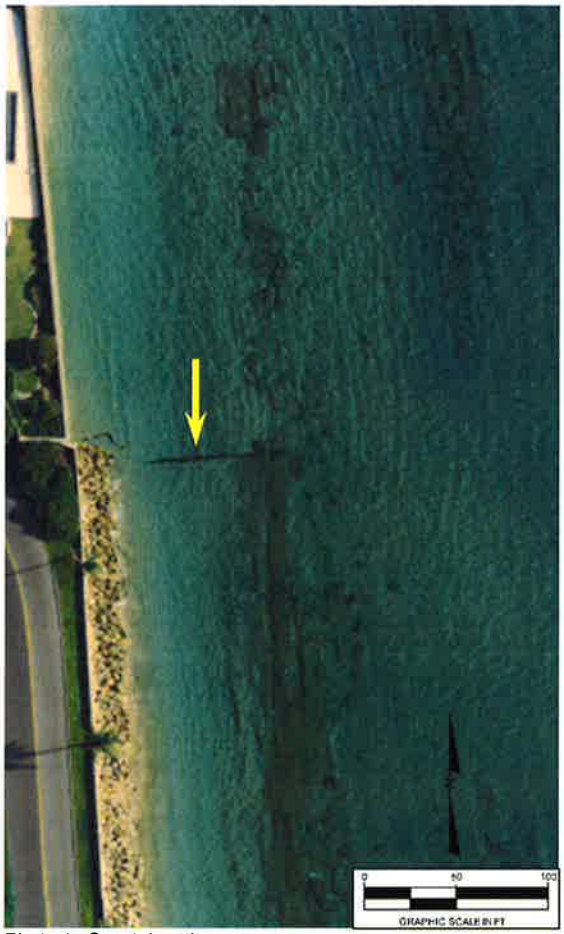


Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. Structure centerline.

Photo 3. Structure condition at seaward end.

Site Visit: July 2014

Photo 4. Structure submerged.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

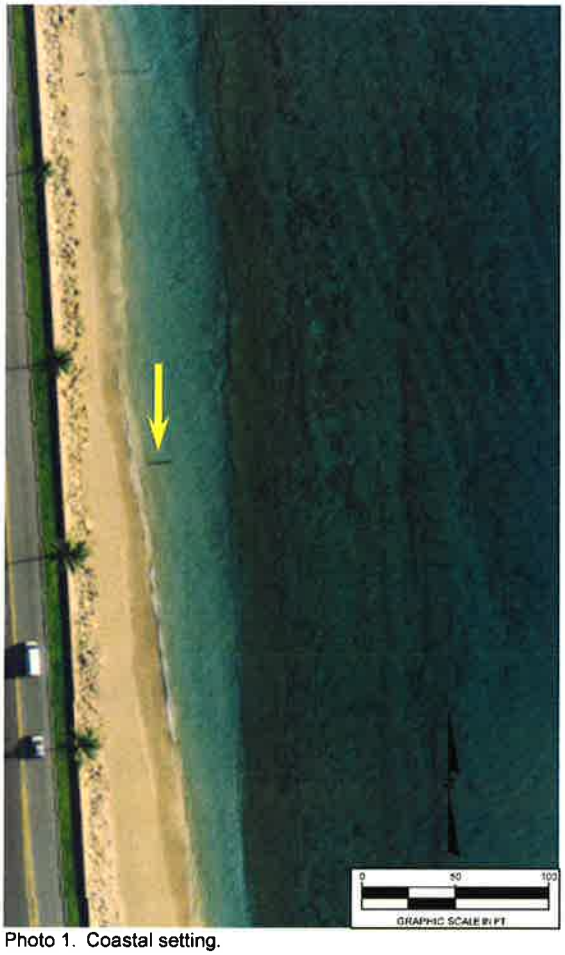


Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 100-ft north of structure looking south.

Photo 3. Structure condition.

Site Visit: July 2014

Photo 4. Structure centerline.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 100-ft north of structure looking south.

Photo 3. Structure condition.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

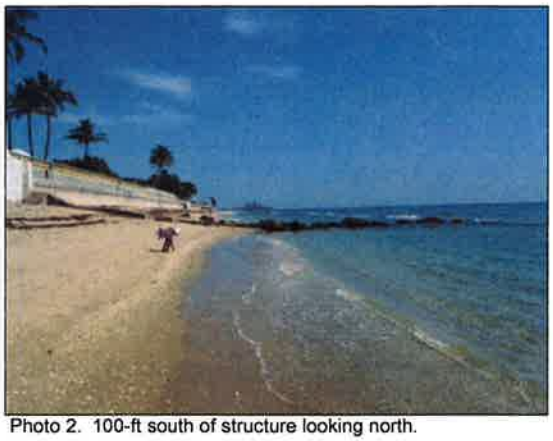


Photo 2. 100-ft south of structure looking north.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. Structure centerline.

Photo 3. Structure condition.

Site Visit: July 2014

Photo 4. 50-ft north of structure looking south.

Photo 5. 50-ft north of structure looking south.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

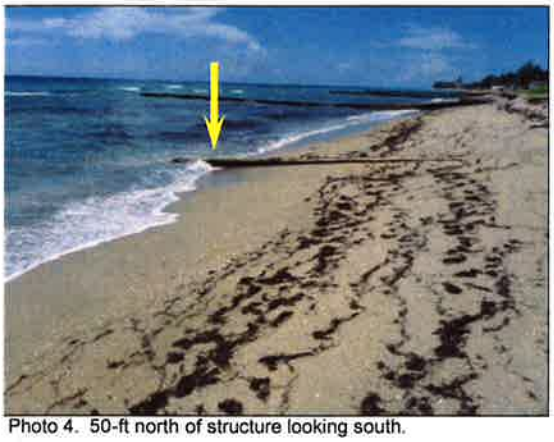


Photo 4. 50-ft north of structure looking south.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

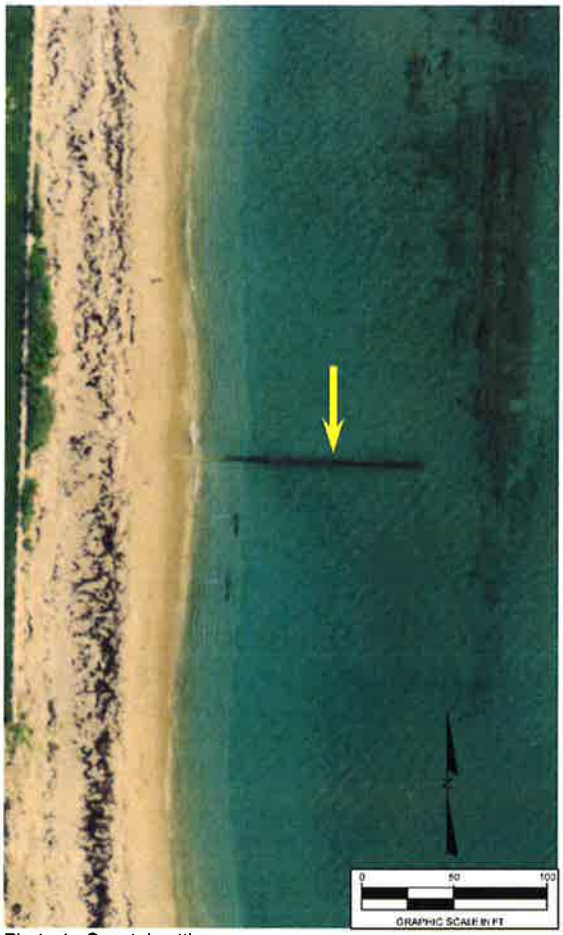


Photo 1. Coastal setting.

Site Visit: June/July 2012

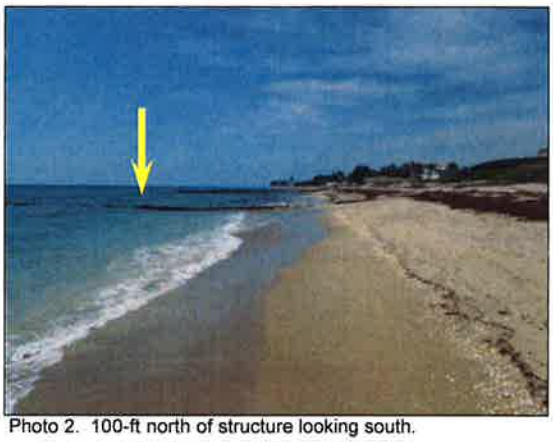


Photo 2. 100-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

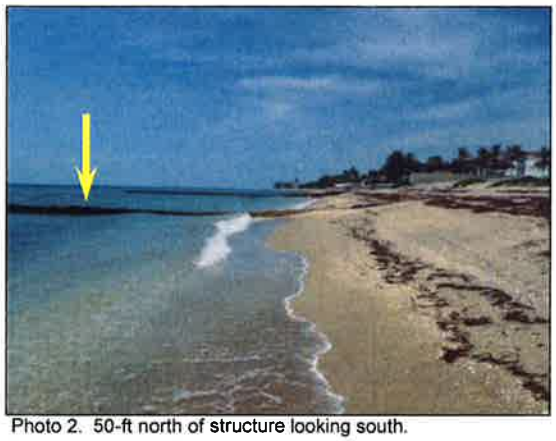


Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. At structure looking north.

Photo 3. Structure condition.

Site Visit: July 2014

Photo 4. 50-ft north of structure looking south.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Photo 2. 50-ft south of structure looking north.

Photo 3. Structure condition.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

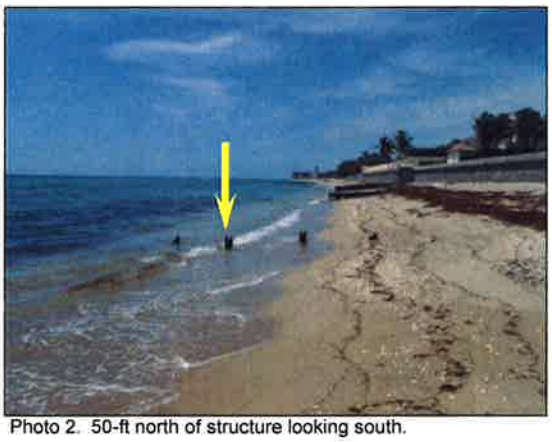


Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. Structure centerline.

Photo 3. 50-ft south of structure looking north.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft south of structure looking north.

Photo 3. Structure condition.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. At structure looking south. Seawall tie back.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

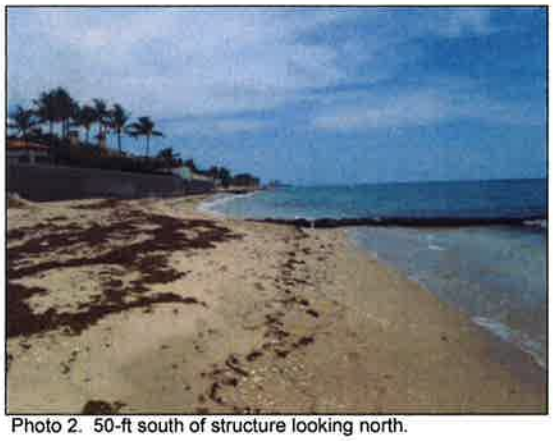


Photo 2. 50-ft south of structure looking north.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

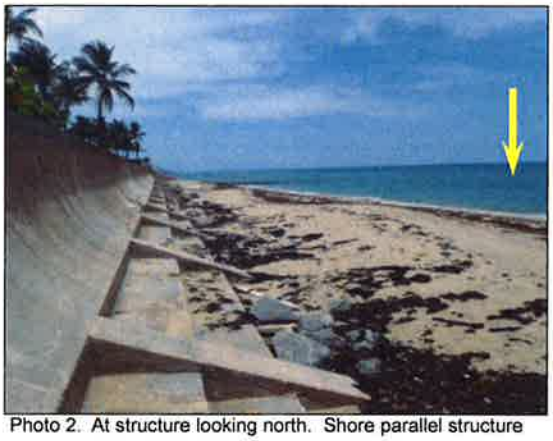


Photo 2. At structure looking north. Shore parallel structure located offshore.

Photo 3. At structure looking east. Shore parallel structure located offshore.

Site Visit: July 2014

Photo 4. At structure looking northeast. Shore parallel structure located offshore.

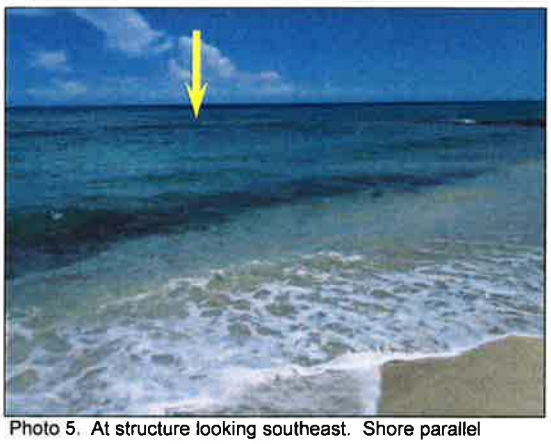


Photo 5. At structure looking southeast. Shore parallel structure located offshore.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

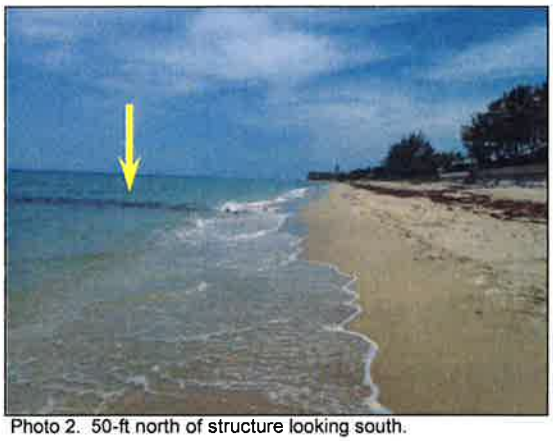


Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

OBSERVATION REPORT

REACH 3

TOWN OF PALM BEACH - GROIN REHABILITATION - REACH 3
OBSERVATION REPORT
G71208
Not previously documented.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

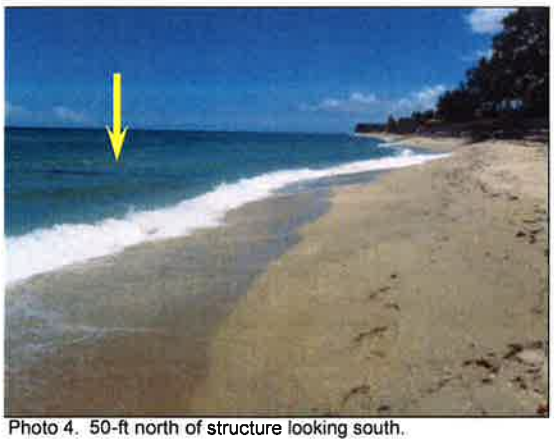


Photo 4. 50-ft north of structure looking south.

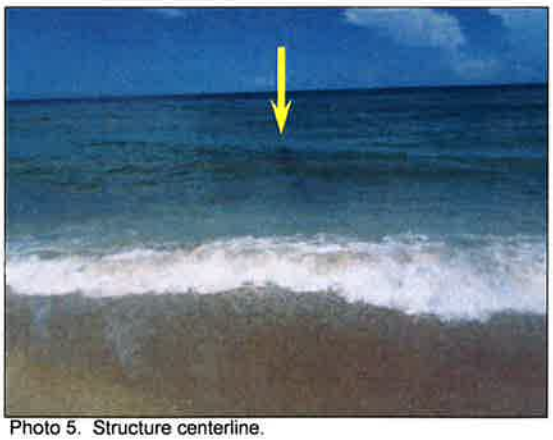


Photo 5. Structure centerline.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

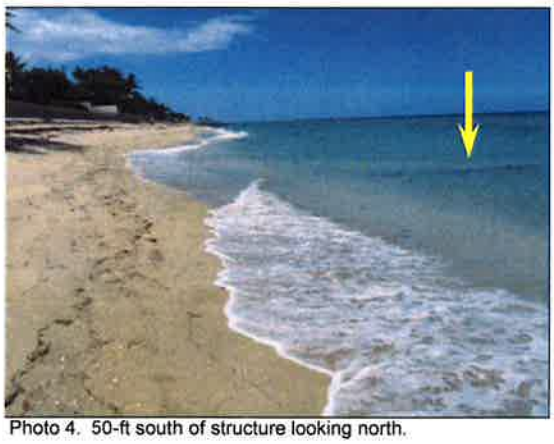


Photo 4. 50-ft south of structure looking north.

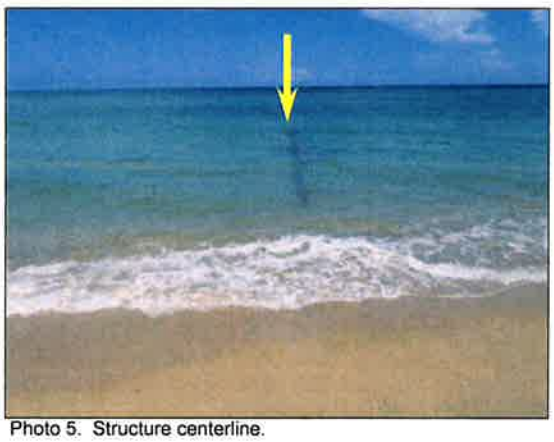


Photo 5. Structure centerline.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. Structure centerline from seawall. Structure submerged.

Photo 3. 50-ft north of structure looking south.

Site Visit: July 2014

Photo 4. Structure centerline.

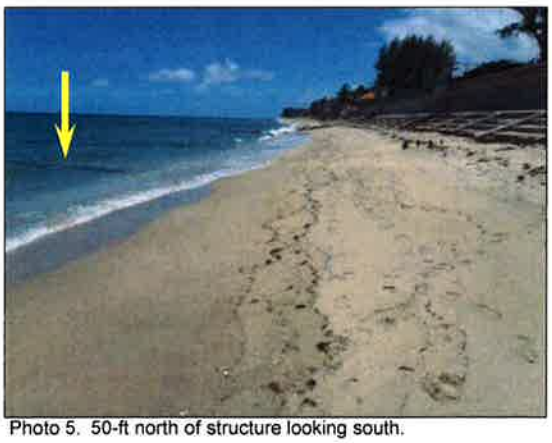


Photo 5. 50-ft north of structure looking south.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Photo 4. 50-ft north of structure looking south.

Photo 5. Structure centerline.

Aerial Photography: July 26, 2013

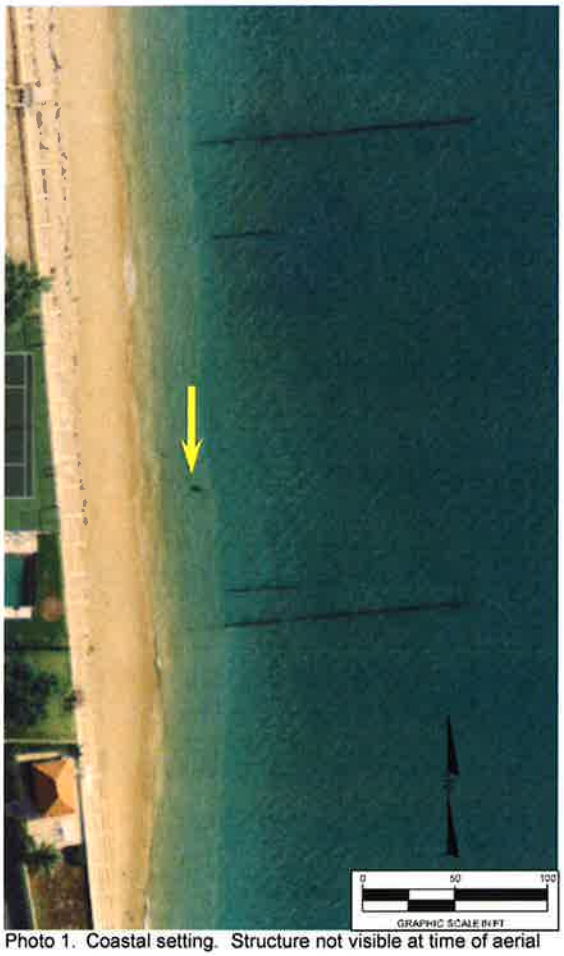


Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Photo 4. 50-ft north of structure looking south.

Photo 5. Structure centerline.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Photo 4. 50-ft south of structure looking north.

Photo 5. Structure centerline.

Aerial Photography: July 26, 2013

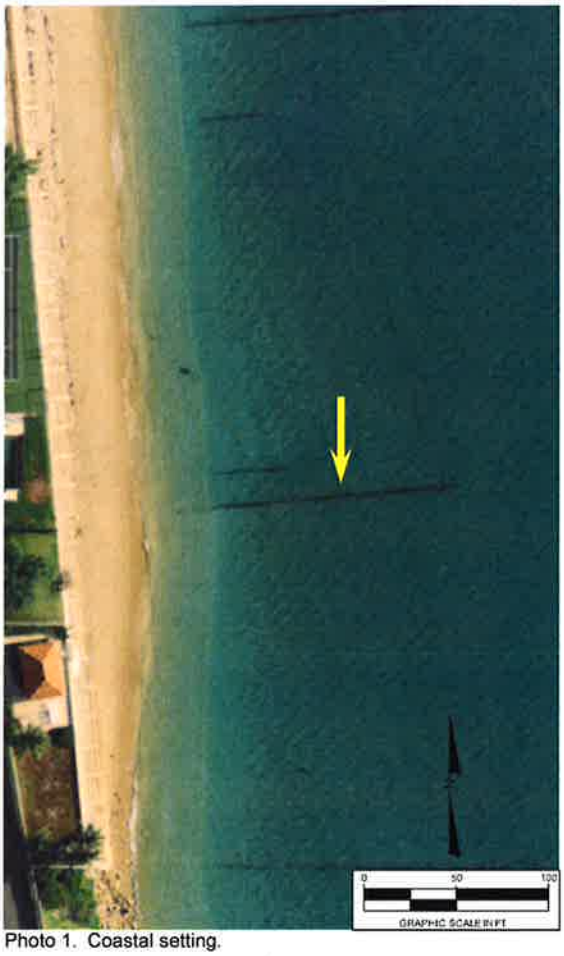


Photo 1. Coastal setting.

Site Visit: June/July 2012

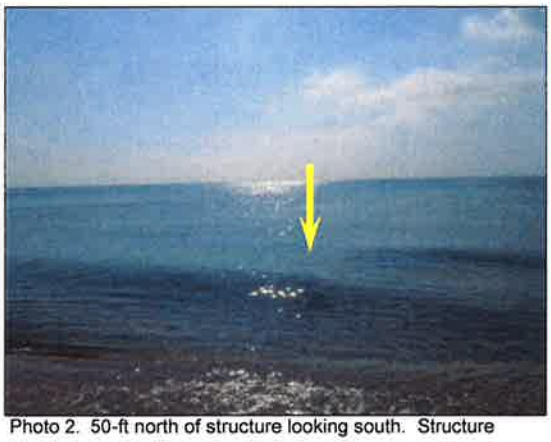


Photo 2. 50-ft north of structure looking south. Structure submerged.

Photo 3. 50-ft south of structure looking north. Structure submerged.

Site Visit: July 2014

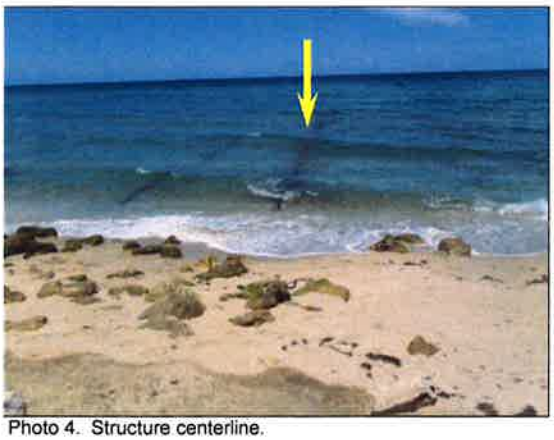


Photo 4. Structure centerline.

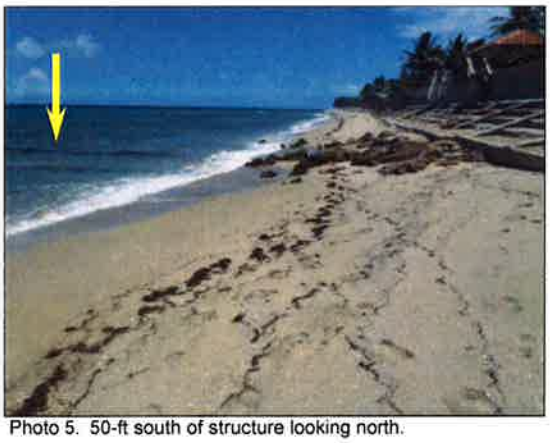


Photo 5. 50-ft south of structure looking north.

Aerial Photography: July 26, 2013

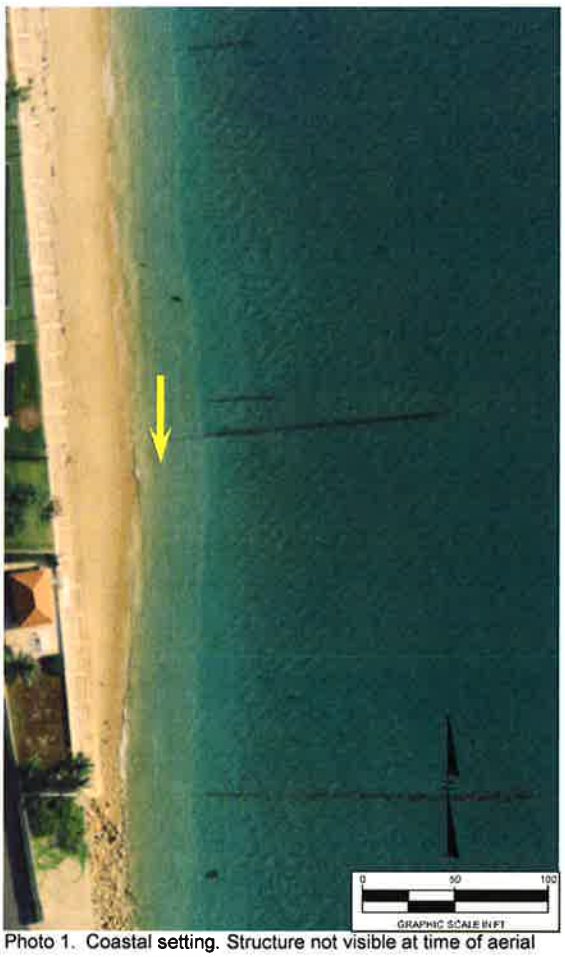


Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

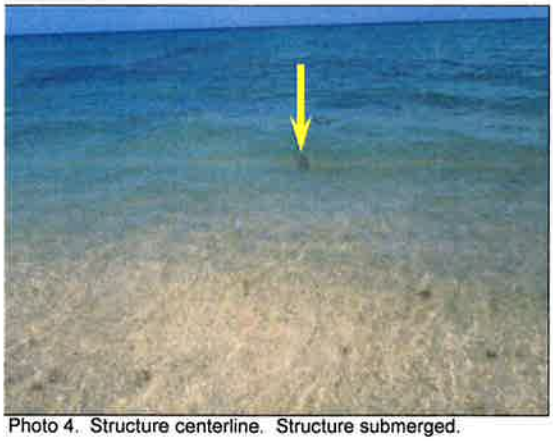


Photo 4. Structure centerline. Structure submerged.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

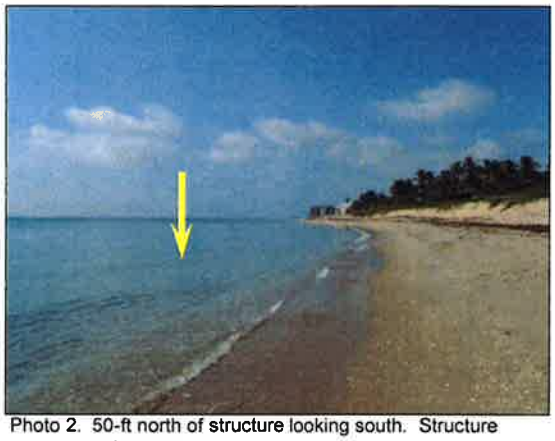


Photo 2. 50-ft north of structure looking south. Structure submerged.

Photo 3. 50-ft south of structure looking north. Structure submerged.

Site Visit: July 2014

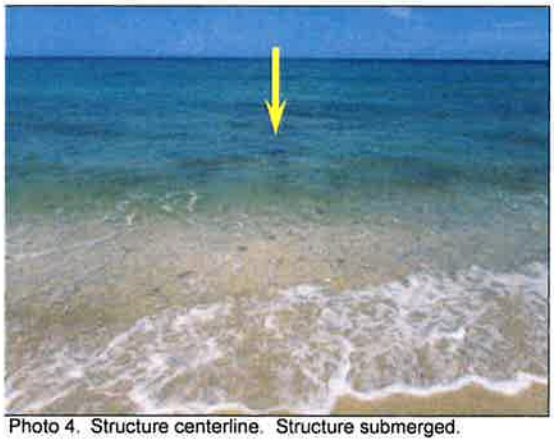


Photo 4. Structure centerline. Structure submerged.

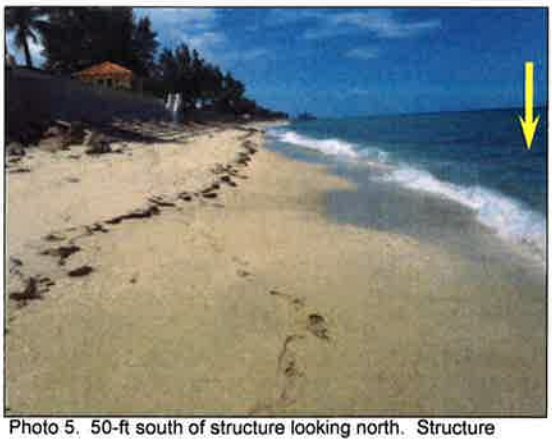


Photo 5. 50-ft south of structure looking north. Structure submerged.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft south of structure looking north. Structure submerged.

Photo 3. 50-ft north of structure looking south. Structure submerged.

Site Visit: July 2014

Structure visible during site visit, but no photos available.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure visible during site visit, but no photos available.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure visible during site visit, but no photos available.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft soutth of structure looking north.

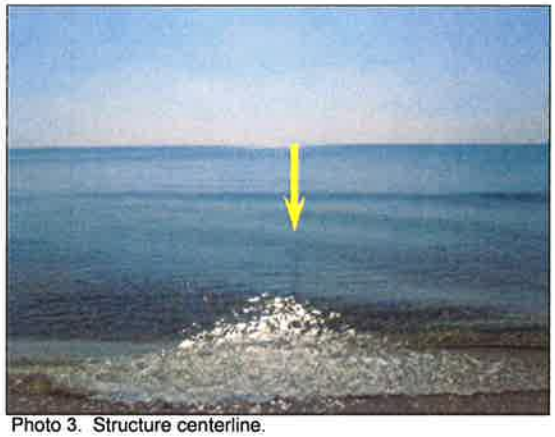


Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure visible during site visit, but no photos available.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure visible during site visit, but no photos available.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure visible during site visit, but no photos available.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure visible during site visit, but no photos available.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

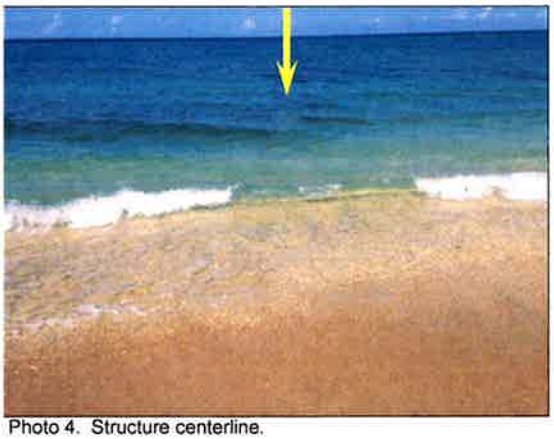


Photo 4. Structure centerline.

Photo 5. 50-ft north of structure looking south.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Photo 4. Structure centerline. Structure submerged.

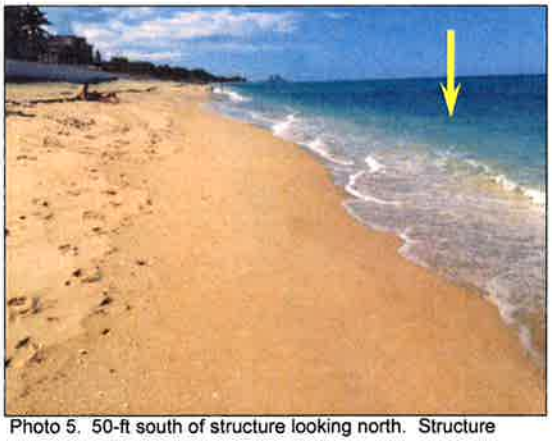


Photo 5. 50-ft south of structure looking north. Structure submerged.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Photo 4. Structure centerline. Structure submerged.

Photo 5. 50-ft north of structure looking south. Structure submerged.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. 50-ft south of structure looking north.

Site Visit: July 2014

Structure visible during site visit, but no photos available.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. 50-ft south of structure looking north.

Site Visit: July 2014

Structure visible during site visit, but no photos available.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. 50-ft south of structure looking north.

Site Visit: July 2014

Structure visible during site visit, but no photos available.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

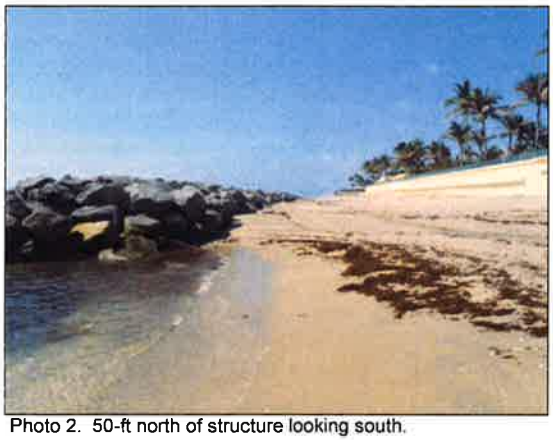


Photo 2. 50-ft north of structure looking south.

Photo 3. 50-ft south of structure looking north.

Site Visit: July 2014

Structure visible during site visit, but no photos available.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

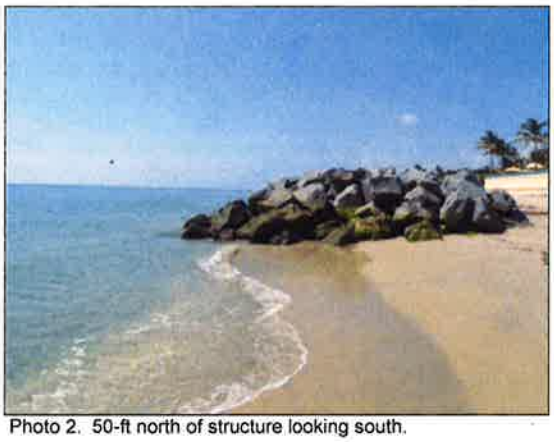


Photo 2. 50-ft north of structure looking south.

Photo 3. 50-ft south of structure looking north.

Site Visit: July 2014

Structure visible during site visit, but no photos available.

Aerial Photography: July 26, 2013

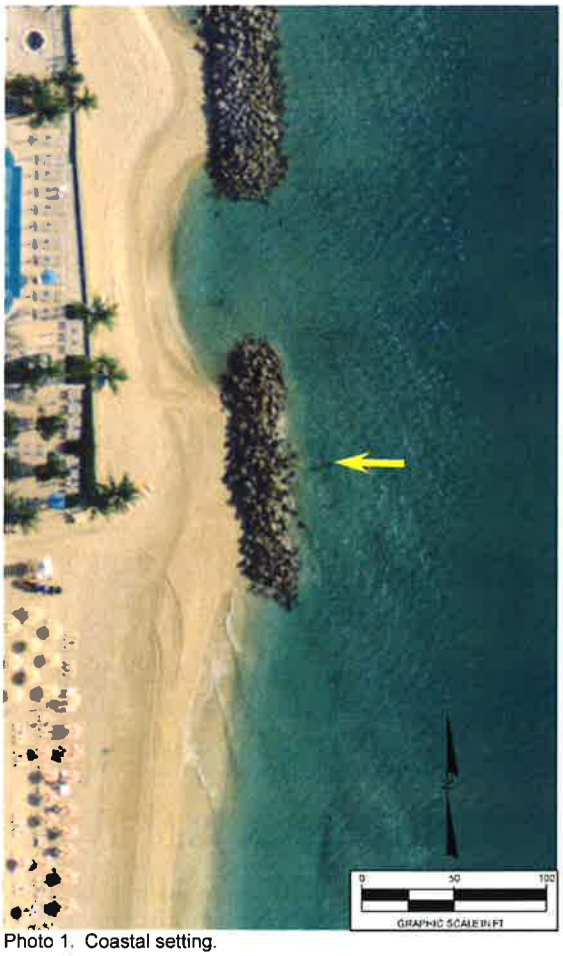


Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline looking south.

Site Visit: July 2014

Structure visible during site visit, but no photos available.

Aerial Photography: July 26, 2013

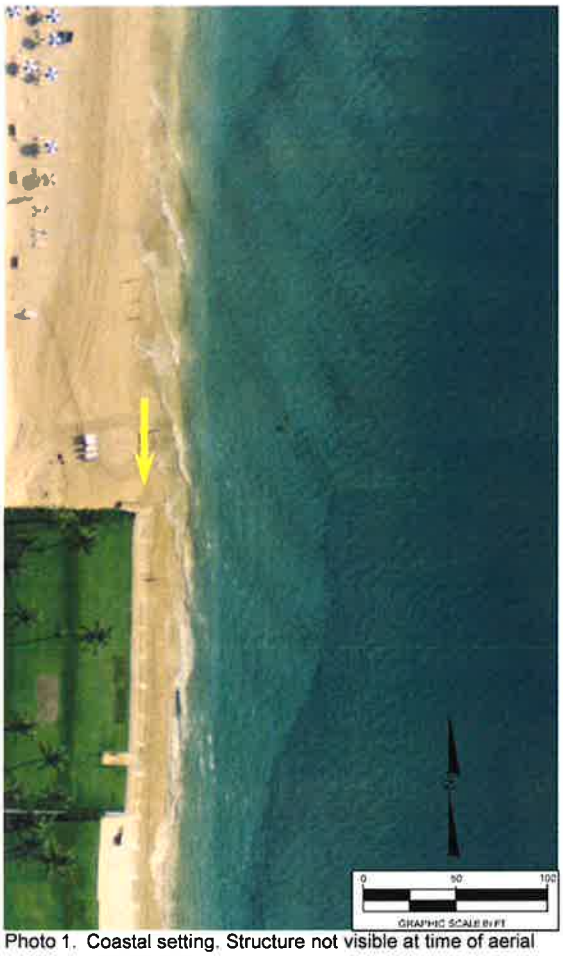


Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Photo 2. Structure centerline looking north.

Photo 3. Structure centerline looking south.

Site Visit: July 2014

Photo 4. Structure centerline.

Photo 5. Structure condition.

OBSERVATION REPORT

REACH 4

TOWN OF PALM BEACH - GROIN REHABILITATION - REACH 4
OBSERVATION REPORT
G64334

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure centerline.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Photo 4. 50-ft south of structure looking north.

Photo 5. Structure centerline.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Photo 4. 50-ft south of structure looking north.

Photo 5. 50-ft north of structure looking south.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Photo 4. 50-ft north of structure looking south.

Photo 5. Structure centerline.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Photo 4. 50-ft south of structure looking north.

Photo 5. Structure centerline.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

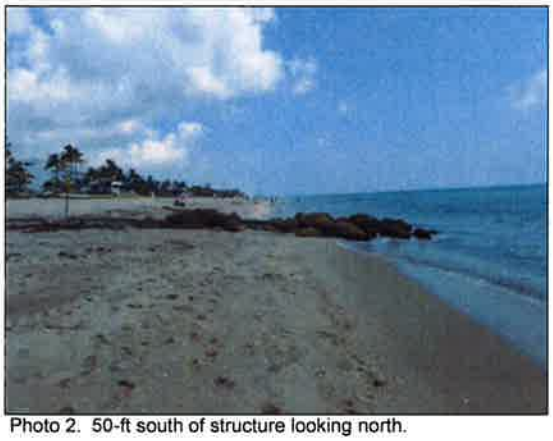


Photo 2. 50-ft south of structure looking north.

Photo 3. Structure centerline.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

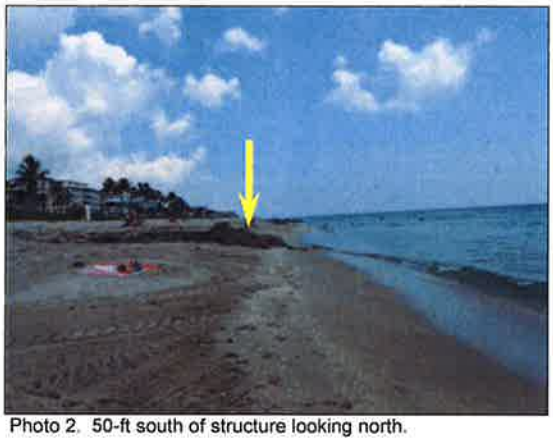


Photo 2. 50-ft south of structure looking north.

Photo 3. Structure centerline.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Photo 2. 50-ft south of structure looking north.

Photo 3. Structure centerline.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. Structure centerline.

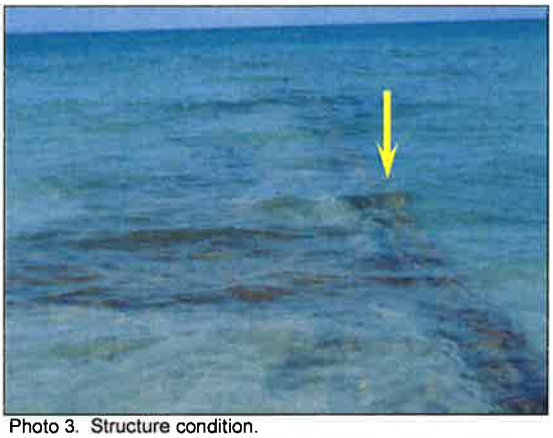


Photo 3. Structure condition.

Site Visit: July 2014

Photo 4. Structure condition.

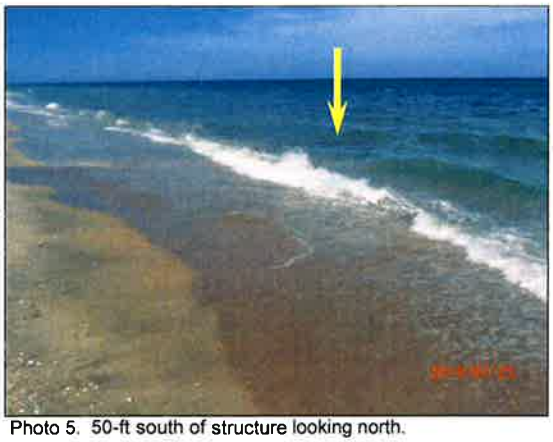


Photo 5. 50-ft south of structure looking north.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

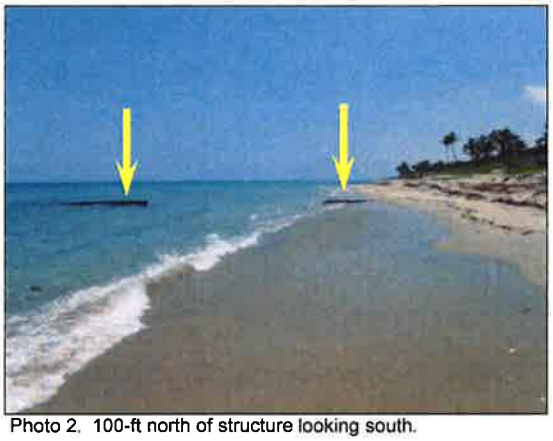


Photo 2. 100-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. 50-ft north of structure looking south.

Aerial Photography: July 26, 2013

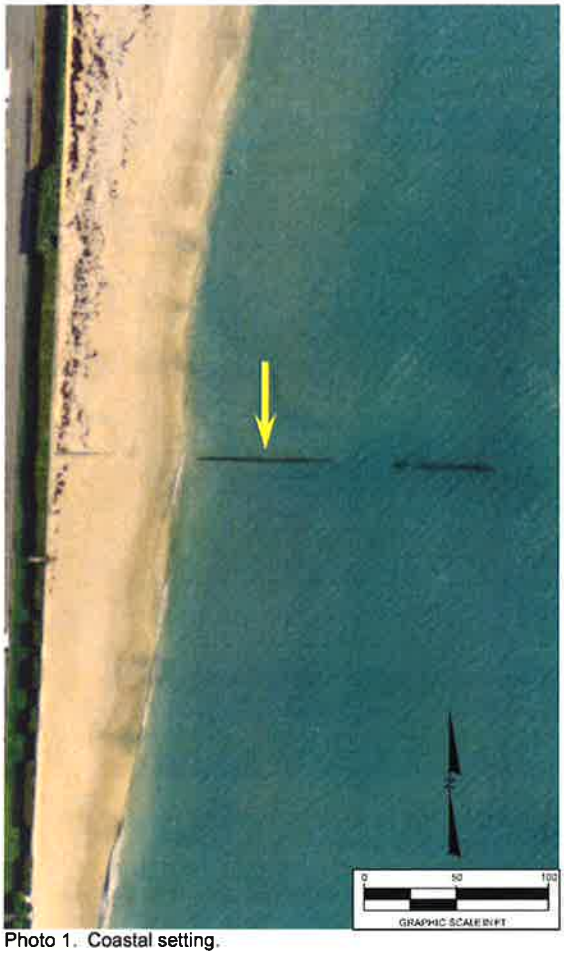


Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft south of structure looking north.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. 50-ft south of structure looking north.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft south of structure looking north.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

OBSERVATION REPORT

REACH 5

TOWN OF PALM BEACH - GROIN REHABILITATION - REACH 5
OBSERVATION REPORT
G57512

Aerial Photography: July 26, 2013

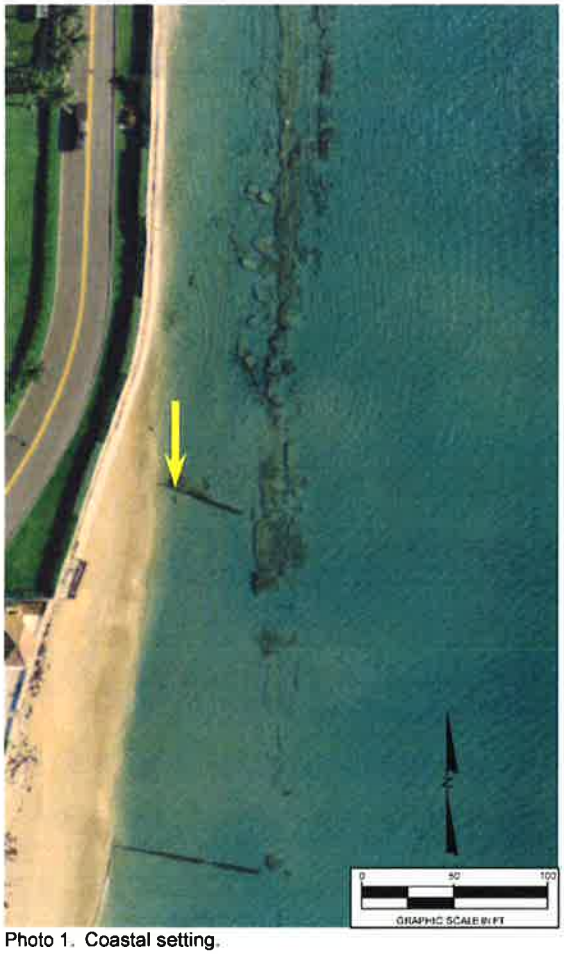


Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. 50-ft south of structure looking north.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

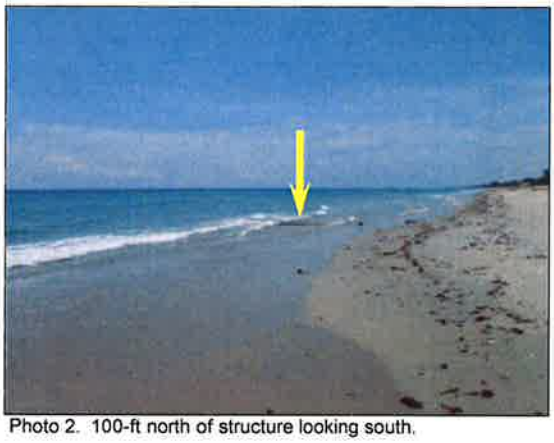


Photo 2. 100-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. 50-ft north of structure looking south.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Photo 4. 50-ft south of structure looking north.

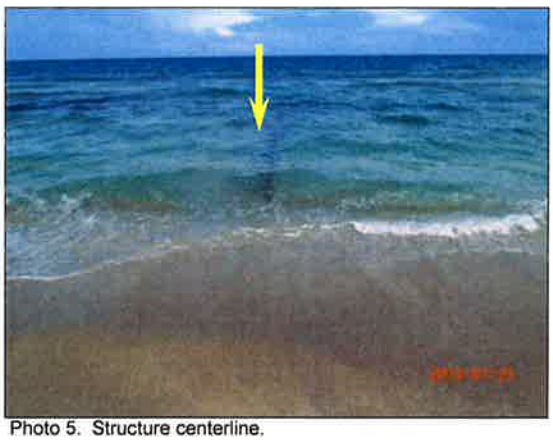


Photo 5. Structure centerline.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft south of structure looking north.

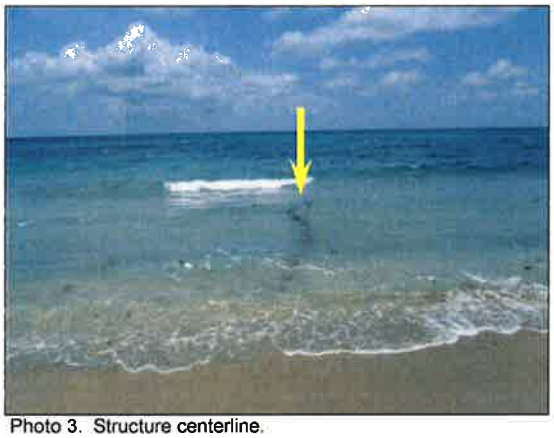


Photo 3. Structure centerline.

Site Visit: July 2014

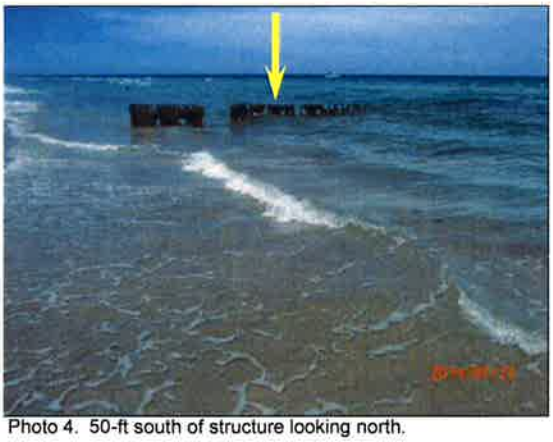


Photo 4. 50-ft south of structure looking north.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. At structure looking north.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. 50-ft south of structure looking north.

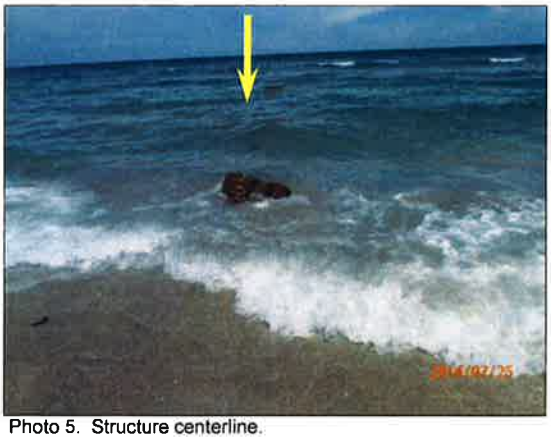


Photo 5. Structure centerline.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft south of structure looking north.

Photo 3. Structure centerline.

Site Visit: July 2014

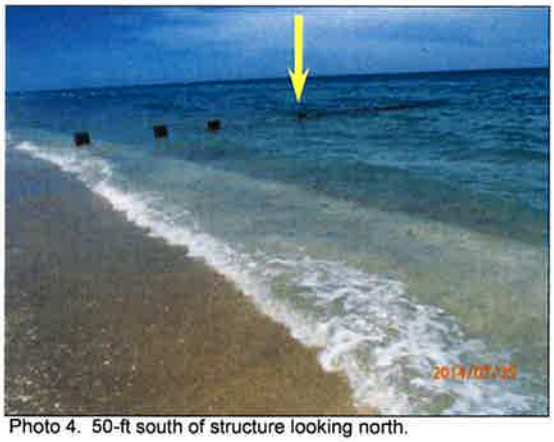


Photo 4. 50-ft south of structure looking north.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

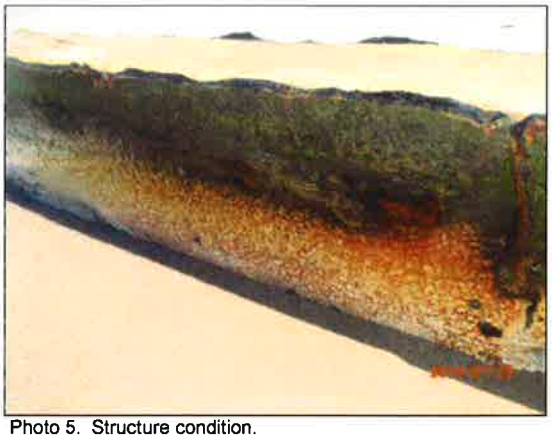


Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

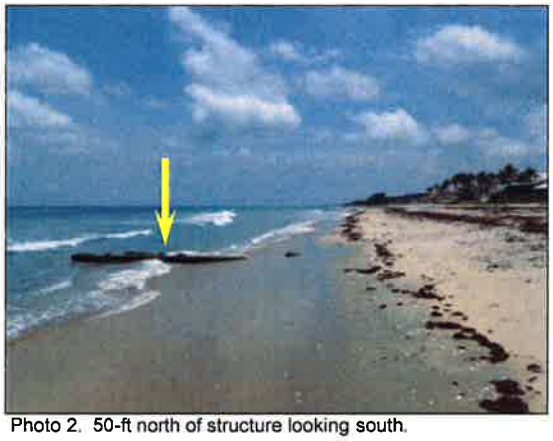


Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

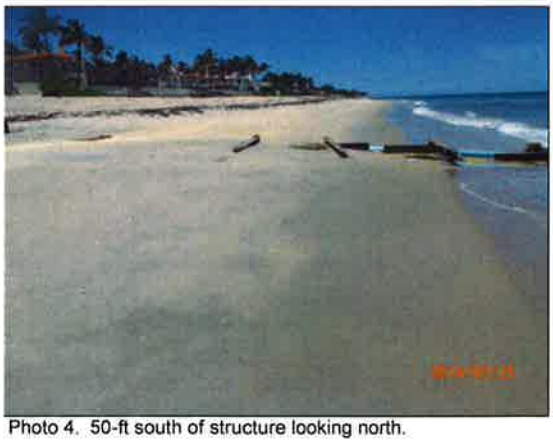


Photo 4. 50-ft south of structure looking north.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

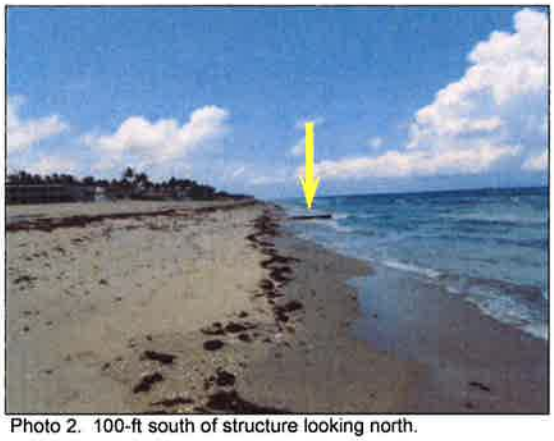


Photo 2. 100-ft south of structure looking north.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. 50-ft south of structure looking north.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

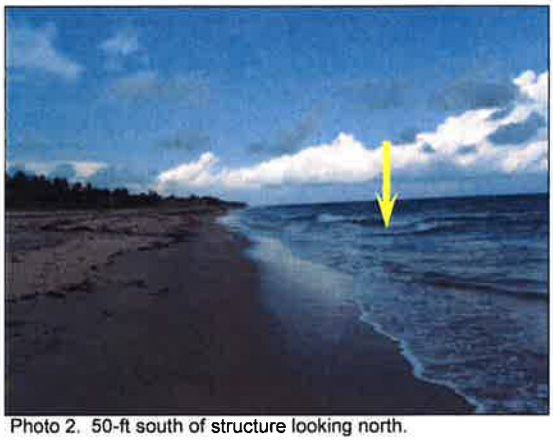


Photo 2. 50-ft south of structure looking north.

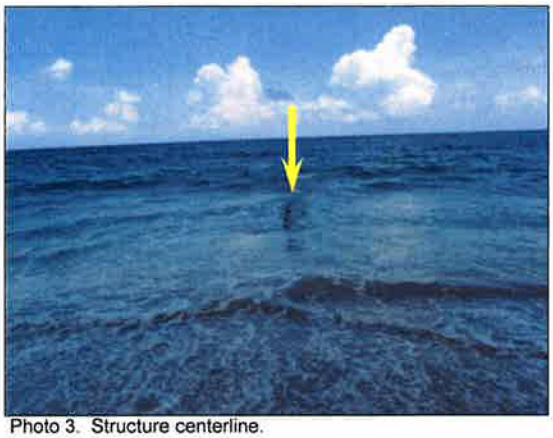


Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

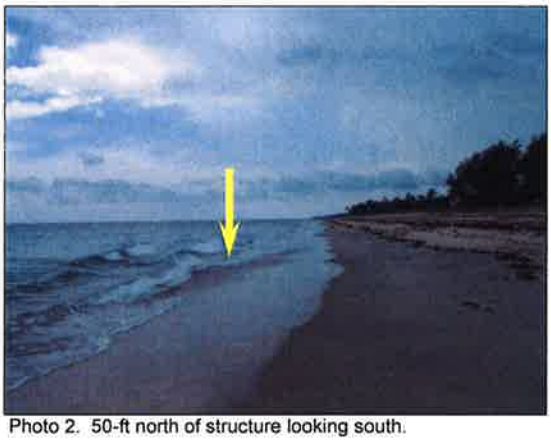


Photo 2. 50-ft north of structure looking south.

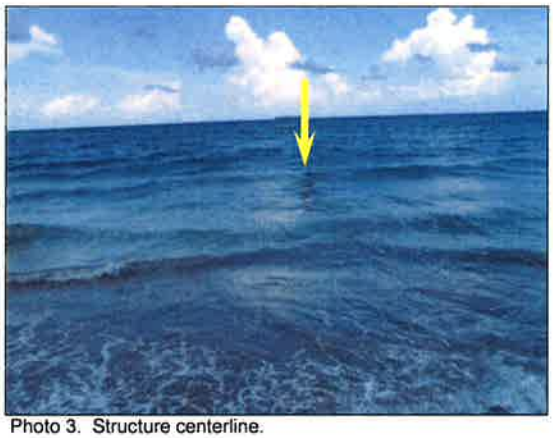


Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. 50-ft south of structure looking north.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft south of structure looking north.

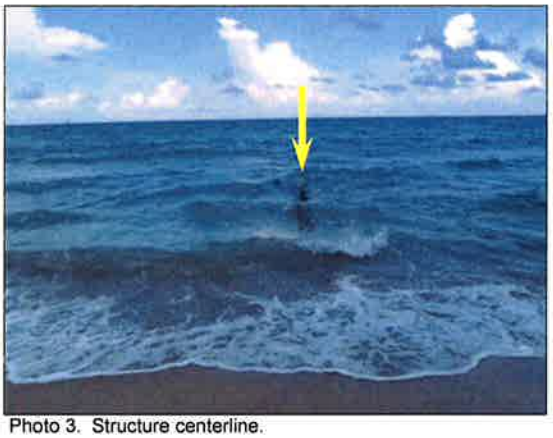


Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. 50-ft north of structure looking south.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

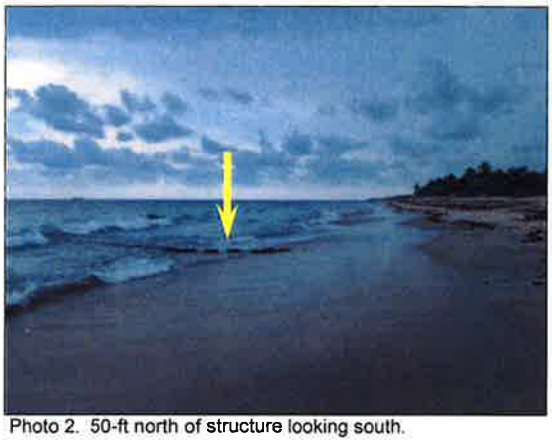


Photo 2. 50-ft north of structure looking south.

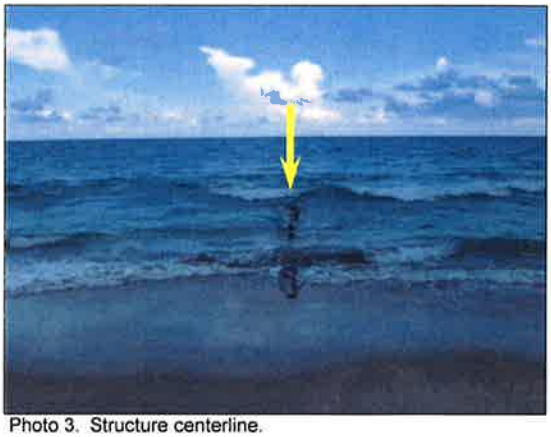


Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. 50-ft south of structure looking north.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure centerline.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

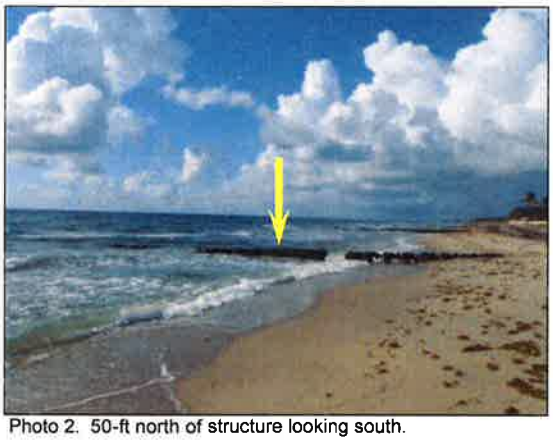


Photo 2. 50-ft north of structure looking south.

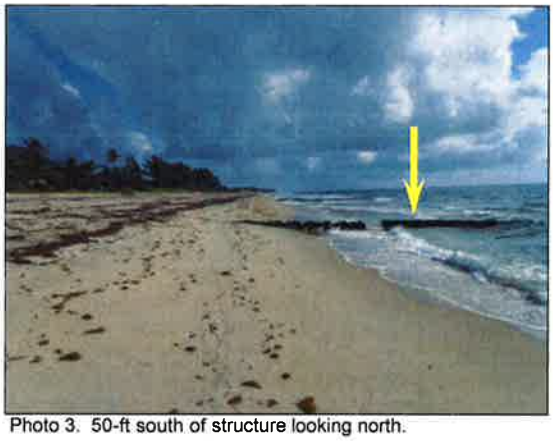


Photo 3. 50-ft south of structure looking north.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. 50-ft south of structure looking north.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. 50-ft south of structure looking north.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. 50-ft south of structure looking north.

Photo 5. Structure condition.

OBSERVATION REPORT

REACH 6

TOWN OF PALM BEACH - GROIN REHABILITATION - REACH 6
OBSERVATION REPORT
G48338

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

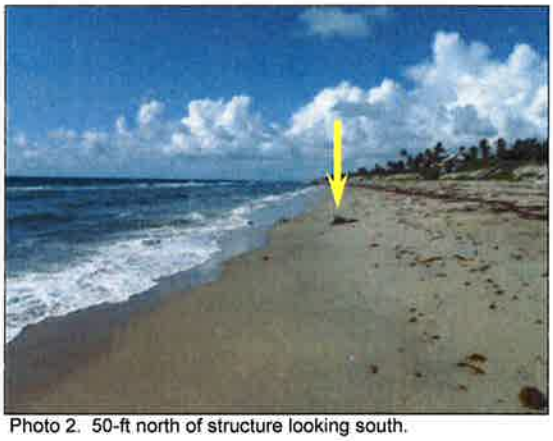


Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft south of structure looking north.

Photo 3. Structure centerline.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Photo 2. 50-ft south of structure looking north.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. 50-ft north of structure looking south.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. 50-ft north of structure looking south.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. At north end of structure looking south.

Photo 3. At south end of structure looking north.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

Structure not visible during site visit.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

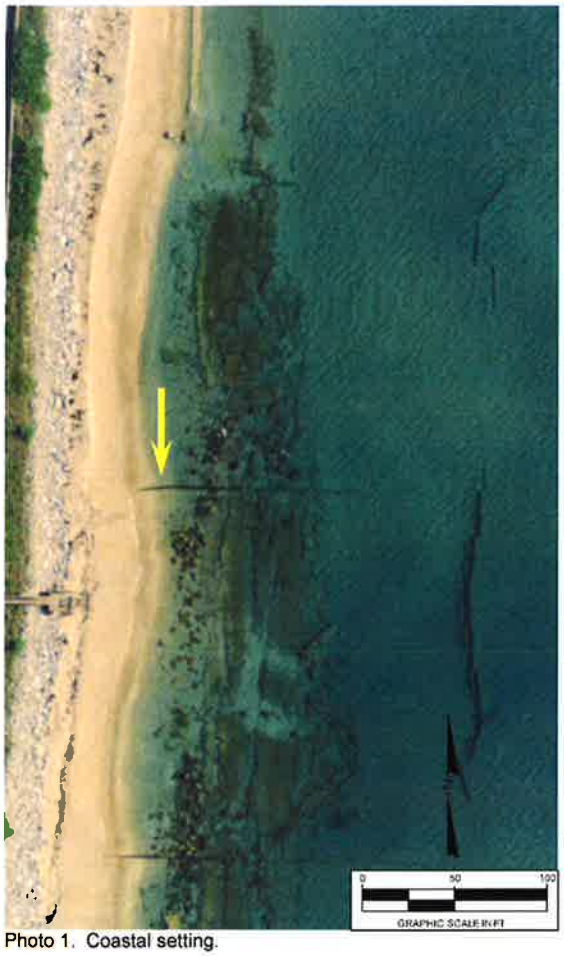


Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft south of structure looking north.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

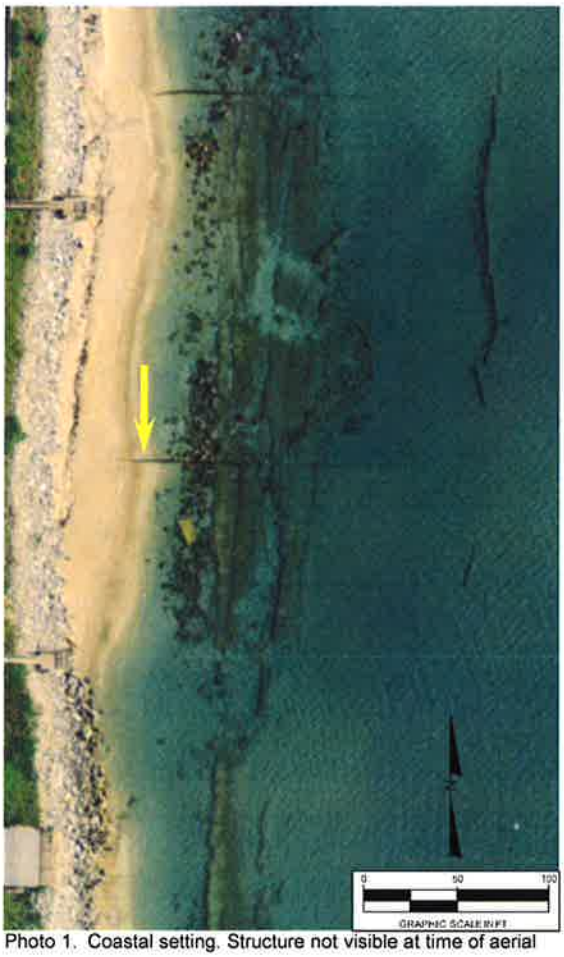


Photo 1. Coastal setting. Structure not visible at time of aerial photography.

Site Visit: June/July 2012

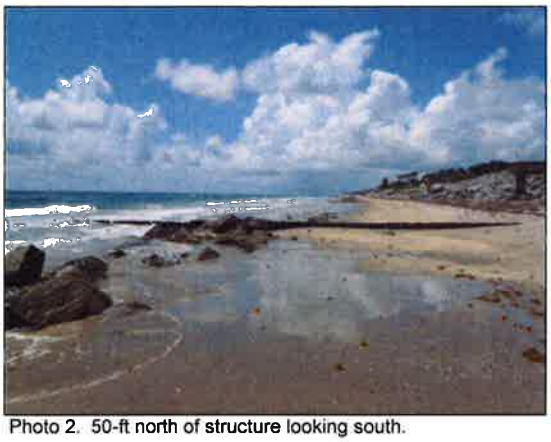


Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. 50-ft south of structure looking north.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Structure not visible during site visit.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

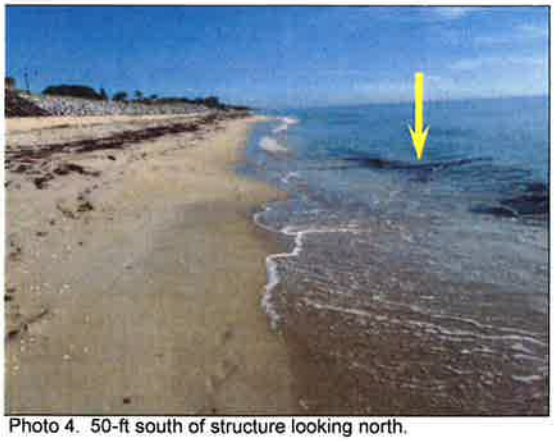


Photo 4. 50-ft south of structure looking north.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. 50-ft south of structure looking north.

Site Visit: July 2014

Photo 4. 50-ft north of structure looking south.

Photo 5. Structure condition.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Site Visit: June/July 2012

Photo 2. 50-ft north of structure looking south.

Photo 3. Structure centerline.

Site Visit: July 2014

Photo 4. Structure condition.

Photo 5. Structure condition.

APPENDIX C

Details of Execution Plan

Reach	Structure Group	Condition of Structure Group	Structure ID	Structure Length[1] (ft)	Proposed Action	General Details	Replace[3]	Remove	Construction Cost[4] ($) Phase 1	Phase 2	Phase 3	Phase 4
Reach 1	R-76 of R-78+500	No coastal structures managed by the Town.	-	-	-	-	-	-				
Reach 2	2A R-78+500 to R-87 G71208 through G74650 (14 structures)	Low crested, steel sheet pile or rubble mound groins spaced approximately 600 feet alongshore. Groins extend cross-shore between seawalls and hardbottom.	G82084	160	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function.	$240,000	$78,000	$318,000			
			G80897	120	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function.	$180,000	$58,500	$238,500			
			G80349	110	Leave In-place	Structure appears to be a component of existing seawall.		$0				
			G80093	100	Leave In-place	Structure appears to be a component of existing seawall.		$0				
			G79857	110	Leave In-place	Structure appears to be a component of existing seawall.		$0				
			G78292	60	Remove	Influence of structure on the coastal system appears minimal. Cut sheet piles to the lowest practical elevation.		$30,000	$30,000			
			G77962	90	Remove	Influence of structure on the coastal system appears minimal. Cut sheet piles to the lowest practical elevation.		$45,000	$45,000			
			G77545	40	Remove	Influence of structure on the coastal system appears minimal. Cut sheet piles to the lowest practical elevation.		$19,500	$19,500			
			G77332	40	Remove	Influence of structure on the coastal system appears minimal. Cut sheet piles to the lowest practical elevation.		$19,500	$19,500			
			G77185	20	Remove	Influence of structure on the coastal system appears minimal. Cut sheet piles to the lowest practical elevation.		$10,500	$10,500			
			G76093	150	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function.	$225,000	$73,500	$298,500			
			G75452	60	Remove	Influence of structure on the coastal system appears minimal. Cut sheet piles to the lowest practical elevation.		$30,000	$30,000			
			G75011	80	Remove	Influence of structure on the coastal system appears minimal. Cut sheet piles to the lowest practical elevation.		$39,000	$39,000			
			G74650	100	Remove/Replace	Existing structure constructed of rubble mound. Remove stones. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones to provide scour protection at the seaward end of the replacement groin.	$150,000	$45,000	$195,000			
	2B R-87 to R-89 G73655 through G72800 (6 structures)	The seawalls and hardbottom diverge south R-87. The length of the groins are longer that Group 2A and the crest elevations are above high tide. The groins are constructed of steel sheet pile with concrete caps spaced approximately 300 feet alongshore. Steel sheet pile at the shoreline has deteriorated becoming porous.	G73655	200	Remove/Replace	Existing structure constructed of steel sheet pile and a concrete cap. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from G74650 to provide scour protection at the seaward end of the replacement groin.	$300,000	$107,500	$407,500			
			G73522	80	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets/concrete core to the lowest practical elevation.		$49,000	$49,000			
			G73376	210	Remove/Replace	Existing structure constructed of steel sheet pile and a concrete cap. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from G74650 to provide scour protection at the seaward end of the replacement groin.	$315,000	$113,500	$428,500			
			G73073	220	Remove/Replace	Existing structure constructed of steel sheet pile and a concrete cap. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from G74650 to provide scour protection at the seaward end of the replacement groin.	$330,000	$120,500	$450,500			
			G72917	40	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets/concrete core to the lowest practical elevation.		$24,500	$24,500			
			G72800	240	Remove/Replace	Existing structure constructed of steel sheet pile and a concrete cap. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from G74650 to provide scour protection at the seaward end of the replacement groin.	$360,000	$129,500	$489,500			
	2C R-89 to R-90+400 G72663 through G71633 (10 structures)	The crest elevations are above high tide at the landward end and slope down becoming submerged during low tide at the seaward end. The groins are of mixed construction types including steel sheet pile, timber, and rubble mound spaced approximately 200 feet alongshore. Steel sheet pile at the shoreline has deteriorated becoming porous.	G72663	70	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$34,500	$34,500			
			G72626	100	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut timber piles to the lowest practical elevation.		$900	$900			
			G72535	80	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$39,000	$39,000			
			G72427	90	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut timber piles to the lowest practical elevation.		$900	$900			
			G72426	190	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from G72010 to provide scour protection at the seaward end of the replacement groin.	$285,000	$93,000	$378,000			
			G72218	10	Leave In-place	Structure appears to be a component of existing seawall.		$0				
			G72010	170	Remove/Replace	Existing structure constructed of steel sheet pile, concrete, and rubble mound. Remove stones. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones to provide scour protection at the seaward end of the replacement groin.	$255,000	$177,500	$432,500			
			71894 & G7163	360	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$175,500	$175,500			
			G71633	150	Remove/Replace	Existing structure constructed of rubble mound. Remove stones. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones to provide scour protection at the seaward end of the replacement groin.	$225,000	$67,000	$292,000			

Reach	Structure Group	Condition of Structure Group	Structure ID	Structure Length[1] (ft)	Proposed Action	General Details	Replace[3]	Remove	Construction Cost[4] ($) Phase 1	Phase 2	Phase 3	Phase 4
Reach 3	3A R-90+400 to R-93+500 G71208 through G67812 (24 structures)	Low crested, steel sheet pile groins spaced approximately 200 feet alongshore. Groins extend cross-shore between seawalls and hardbottom.	G71208	120	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from G71633 to provide scour protection at the seaward end of the replacement groin.	$180,000	$58,500		$238,500		
			G71020	110	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$54,000		$54,000		
			G70910	230	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from G71633 to provide scour protection at the seaward end of the replacement groin.	$345,000	$112,500		$457,500		
			G70845	120	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$58,500		$58,500		
			G70724	60	Remove	Influence of structure on the coastal system appears minimal. Remove stones.		$27,000		$27,000		
			G70657	110	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$54,000		$54,000		
			G70651	210	Remove/Replace	Existing structure constructed of steel sheet pile and rubble mound. Remove stone. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones and those removed from G70724 to provide scour protection at the seaward end of the replacement groin.	$315,000	$117,500		$432,500		
			G70620	40	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$19,500		$19,500		
			G70451	230	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from G70724 to provide scour protection at the seaward end of the replacement groin.	$345,000	$112,500		$457,500		
			G70324	70	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$34,500		$34,500		
			G70239	60	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$30,000		$30,000		
			G70221	50	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$25,500		$25,500		
			G70119	50	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$25,500		$25,500		
			G70027	90	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$135,000	$45,000		$180,000		
			G69902	50	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$25,500		$25,500		
			G69813	180	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$270,000	$88,500		$358,500		
			G69567	130	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$64,500		$64,500		
			G69329	150	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$73,500		$73,500		
			G69097	140	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$69,000		$69,000		
			G68939	140	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$69,000		$69,000		
			G68803	30	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$15,000		$15,000		
			G68412	240	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$360,000	$117,000		$477,000		
			G68194	220	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$108,000		$108,000		
			G67812	130	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut timber piles to the lowest practical elevation.		$1,200		$1,200		
	3B R-93+500 to R-95 G67472 through G65583 (7 structures)	T-head groins managed by the Breakers Hotel. The structures were rehabilitated the winter of 2011/2012.	G67472	270	Leave In-place	Structure rehabilitated the winter of 2011/2012.		$0				
			G66975	150	Leave In-place	Structure rehabilitated the winter of 2011/2012.		$0				
			G66724	110	Leave In-place	Structure rehabilitated the winter of 2011/2012.		$0				
			G66479	110	Leave In-place	Structure rehabilitated the winter of 2011/2012.		$0				
			G66275	110	Leave In-place	Structure constructed the winter of 2011/2012.		$0				
			G66082	130	Leave In-place	Structure rehabilitated the winter of 2011/2012.		$0				
			G65583	230	Leave In-Place	Structure partially removed the winter of 2011/2012.		$0				

Reach	Structure Group	Condition of Structure Group	Structure ID	Structure Length[1] (ft)	Proposed Action	General Details	Construction Cost[4] ($) Replace[3]	Remove	Phase 1	Phase 2	Phase 3	Phase 4
Reach 4	4A R-95 to R-99+500 G64334 through G61703 (11 structures)	Groins within the Mid-Town Beach Nourishment Project Area. The groins are spaced approximately 350 feet alongshore. They are comprised of Prefabricated Erosion Prevent (PEP) units overlain by 2-3 foot diameter limestone boulders.	G64334	140	Leave In-place	Structure is generally buried by the Mid-Town Beach Restoration Project.		$0				
			G64060	90	Leave In-place	Structure is generally buried by the Mid-Town Beach Restoration Project.		$0				
			G63737	120	Leave In-place	Structure is generally buried by the Mid-Town Beach Restoration Project.		$0				
			G63398	130	Leave In-place	Structure is generally buried by the Mid-Town Beach Restoration Project.		$0				
			G63083	140	Leave In-place	Structure is generally buried by the Mid-Town Beach Restoration Project.		$0				
			G62756	140	Leave In-place	Structure is generally buried by the Mid-Town Beach Restoration Project.		$0				
			G62381	170	Leave In-place	Structure is generally buried by the Mid-Town Beach Restoration Project.		$0				
			G62004	140	Leave In-place	Structure is generally buried by the Mid-Town Beach Restoration Project.		$0				
			G61654	140	Leave In-place	Structure is generally buried by the Mid-Town Beach Restoration Project.		$0				
			G61332	120	Leave In-place	Structure is generally buried by the Mid-Town Beach Restoration Project.		$0				
			G61073	100	Leave In-place	Structure is generally buried by the Mid-Town Beach Restoration Project.		$0				
	4B R-99+500 to R-102+300 G60352 through G58554 (5 structures)	Low crested, steel sheet pile groins spaced approximately 500 feet alongshore. Groins extend cross-shore between seawalls and hardbottom.	G60352	230	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$345,000	$112,500			$457,500	
			G59940	240	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$360,000	$117,000			$477,000	
			G59451	240	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$360,000	$117,000			$477,000	
			G59002	230	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$345,000	$112,500			$457,500	
			G58554	200	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$300,000	$97,500			$397,500	

Reach	Structure Group	Condition of Structure Group	Structure ID	Structure Length[1] (ft)	Proposed Action	General Details	Replace[3]	Remove	Construction Cost[4] ($) Phase 1	Phase 2	Phase 3	Phase 4
Reach 5	5A R-102+300 to R- 104+500 G57512 through G56253 (4 structures)	Low crested, steel sheet pile groins unevenly spaced alongshore (average 650 feet). Groins have deteriorated becoming porous.	G57512	70	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$105,000	$34,500			$139,500	
			G57312	140	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$210,000	$69,000			$279,000	
			G57136	170	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$255,000	$84,000			$339,000	
			G56253	170	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$255,000	$84,000			$339,000	
	5B R-104+500 to R-107+500 G54947 through G51896 (11 structures)	Groins are uniformly spaced approximately 300 feet alongshore. The crest elevations generally slope or step-down as they extend offshore such that only the landward ends are exposed during high tide. They are constructed of concrete encased by steel sheets. The northern two groins have deteriorated becoming porous at the landward ends.	G54947	200	Remove/Replace	Existing structure constructed of steel sheet pile and concrete blocks. Remove concrete blocks. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$300,000	$98,500			$398,500	
			G54602	200	Remove/Replace	Existing structure constructed of steel sheet pile and concrete pile-panel. Remove structure or cut piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$300,000	$97,500			$397,500	
			G54176	200	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G53758	200	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G53464	180	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G53159	160	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G52871	180	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G52571	180	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G52280	250	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G52129	130	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G51896	160	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$240,000	$78,000				$318,000
	5C R-107+500 to R-110+100 G51225 through G48688 (10 structures)	Groins are uniformly spaced approximately 300 feet alongshore. The crest elevations generally slope or step-down as they extend offshore such that only the landward ends are exposed during high tide. They are constructed of constructed of steel sheet pile, of steel sheet pile with a concrete cap, or of mixed construction materials. The groins have deteriorated becoming porous, but a dry beach is maintained throughout seasonal fluctuations.	G51225	240	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$360,000	$117,000				$477,000
			G50946	230	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$345,000	$112,500				$457,500
			G50601	230	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$345,000	$112,500				$457,500
			G50249	180	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$270,000	$88,500				$358,500
			G49866	210	Remove/Replace	Existing structure constructed of steel sheet pile with concrete cap. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$315,000	$108,500				$423,500
			G49583	210	Remove/Replace	Existing structure constructed of steel sheet pile with concrete cap. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$315,000	$108,500				$423,500
			G49351	210	Remove/Replace	Existing structure constructed of steel sheet pile with concrete cap. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$315,000	$108,500				$423,500
			G49088	200	Remove/Replace	Existing structure constructed of steel sheet pile, timber pile, concrete core, and rubble mound. Remove stones. Remove structure or cut sheet piles, concrete core, and timber piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones to provide scour protection at the seaward end of the replacement groin.	$300,000	$200,900				$500,900
			G48818	190	Remove/Replace	Existing structure constructed of steel sheet pile, timber pile, concrete core, and rubble mound. Remove stones. Remove structure or cut sheet piles, concrete core, and timber piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones to provide scour protection at the seaward end of the replacement groin.	$285,000	$186,100				$471,100
			G48688	250	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut steel sheets piles to the lowest practical elevation.		$123,000				$123,000

Reach	Structure Group	Condition of Structure Group	Structure ID	Structure Length[1] (ft)	Proposed Action	General Details	Replace[3]	Remove	Construction Cost[4] ($) Phase 1	Phase 2	Phase 3	Phase 4
Reach 6	6A R-110+100 to R-116+500 G48338 through G42198 (22 structures)	Low crested, steel sheet pile groins that are uniformly spaced approximately 300 feet alongshore. Groins in front of the FDOT revetment along SR A1A are intact and extend offshore to hardbottom. The two groins at the north end of the FDOT revetment have lower crest elevations.	G48338	10	Leave In-place	Structure appears to be a component of existing seawall.		$0				
			G48015	70	Remove/Replace	Existing structure constructed of rubble mound. Remove stones. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones to provide scour protection at the seaward end of the replacement groin.	$105,000	$32,000				$137,000
			G47636	100	Remove/Replace	Existing structure constructed of steel sheet pile. Remove structure or cut sheet piles to the lowest practical elevation. Replace with concrete king pile-panel groin to maintain current function. Beneficially reuse stones removed from other structures to provide scour protection at the seaward end of the replacement groin.	$150,000	$49,500				$199,500
			G47215	140	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G46914	90	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G46616	90	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G46316	80	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G46014	100	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G45718	210	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G45418	100	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G45119	100	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G44835	90	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G44553	180	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			A44411	600	Remove	Influence of structure on the coastal system appears minimal. Remove structure or cut concrete cap/steel sheets piles to the lowest practical elevation.		$322,500				$322,500
			G44260	160	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G43652	90	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G43451	180	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G43154	70	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G42915	80	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G42684	80	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G42440	80	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				
			G42198	100	Leave In-place	Structure influencing coastal system. Structure intact and construction type is generally consistent with the other groins in the structural field.		$0				

Reach	Structure Group	Condition of Structure Group	Structure ID	Structure Length[1] (ft)	Proposed Action	General Details	Replace[3]	Remove	Construction Cost[2] ($) Phase 1	Phase 2	Phase 3	Phase 4
Reach 7	R-116+500 to R-128+530	No coastal structures managed by the Town.	-	-	-	-	-	-				
Reach 8	R-128+530 to R-134+135	No coastal structures managed by the Town.	-	-	-	-	-	-				
								Construction Cost:	**$4,446,300**	**$3,355,700**	**$4,159,000**	**$5,093,000**
								Mobilization:	**$500,000**	**$500,000**	**$500,000**	**$500,000**
								Phase Total:	**$4,946,300**	**$3,855,700**	**$4,659,000**	**$5,593,000**

[1]Structure length defined for groins as the distance from seawall (dune vegetation) to the seaward end of structure. The length for shore parallel structures is the alongshore length of the structure.

[2]Construction costs due not include design, permitting, and monitoring costs.

[3]Replace costs assumes that concrete king pile and panel groin will be constructed.

TOWN OF PALM BEACH
COASTAL HARD STRUCTURE TECHNOLOGY

April 28, 2022

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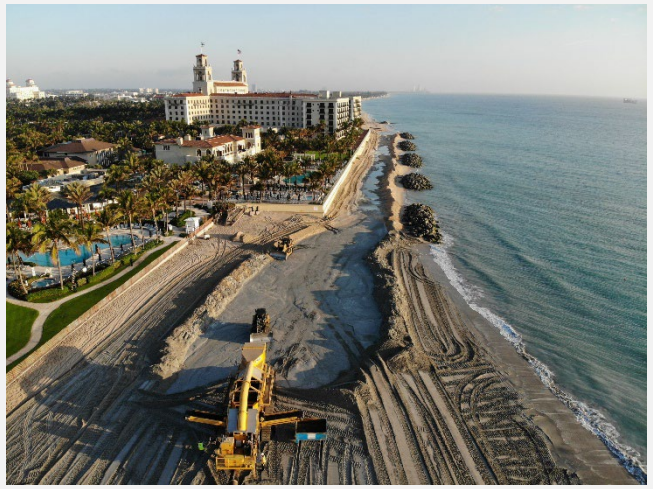
COASTAL STRUCTURES AS DEFINED BY STATUTE

"**Coastal or shore protection structure**" means shore-hardening structures, such as seawalls, bulkheads, revetments, rubble mound structures, groins, breakwaters, and aggregates of materials other than beach sand used for shoreline protection; beach and dune restoration; and other structures which are intended to prevent erosion or protect other structures from wave and hydrodynamic forces. – **Chapter 161.54(6)(d) F.S.**



Drone photograph on right courtesy of The Breakers

COASTAL STRUCTURE TYPES

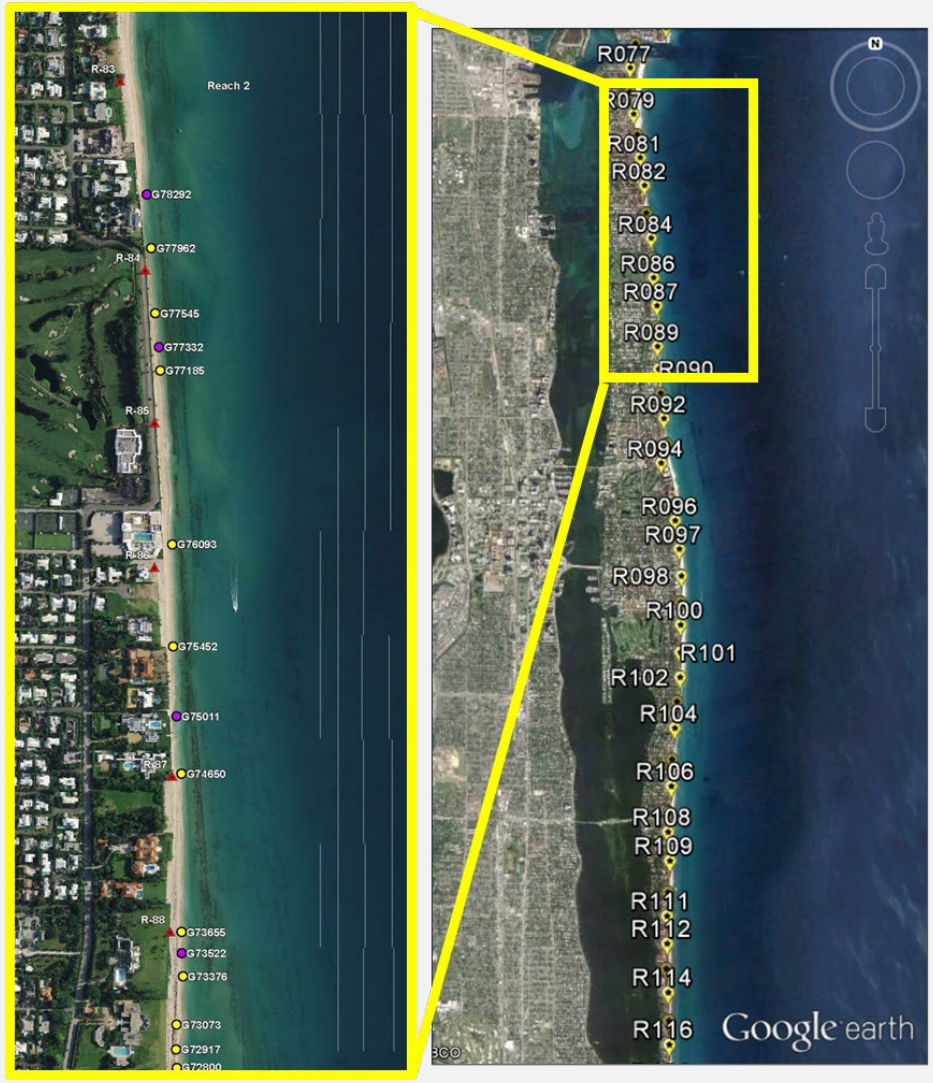
- Shoreline Hardening:
  - Seawalls
  - Revetments
  - Bulkheads
- Sand Retention / Erosion Control:
  - Groins
  - Breakwaters
  - Reefs

- ✓ Highly effective for beach stabilization
- ✓ Address erosion hotspots
- ✓ Control distribution of sand
- ✓ Used widely throughout recent history
- ✓ Often used in combination with other efforts
- ✓ Extend life of beach nourishment projects
- ✓ Require maintenance for long term effectiveness
- ✓ Modern focus on strategic usage and adjustability

- Can be used to control sand transport and distribution
- Can not “create” sand

Coastal Protection Engineering

TOWN OF PALM BEACH GROIN REHABILITATION



- Execution strategies and priorities for a Groin Rehabilitation Plan (Reaches 2-6):
  - Studies and Inventory
  - Materials and Conditions
  - Implementation Assessment
  - Permitting Approach
  - Cost Comparisons
  - Recommendations
  - Execution Plan

COASTAL PROTECTION ENGINEERING

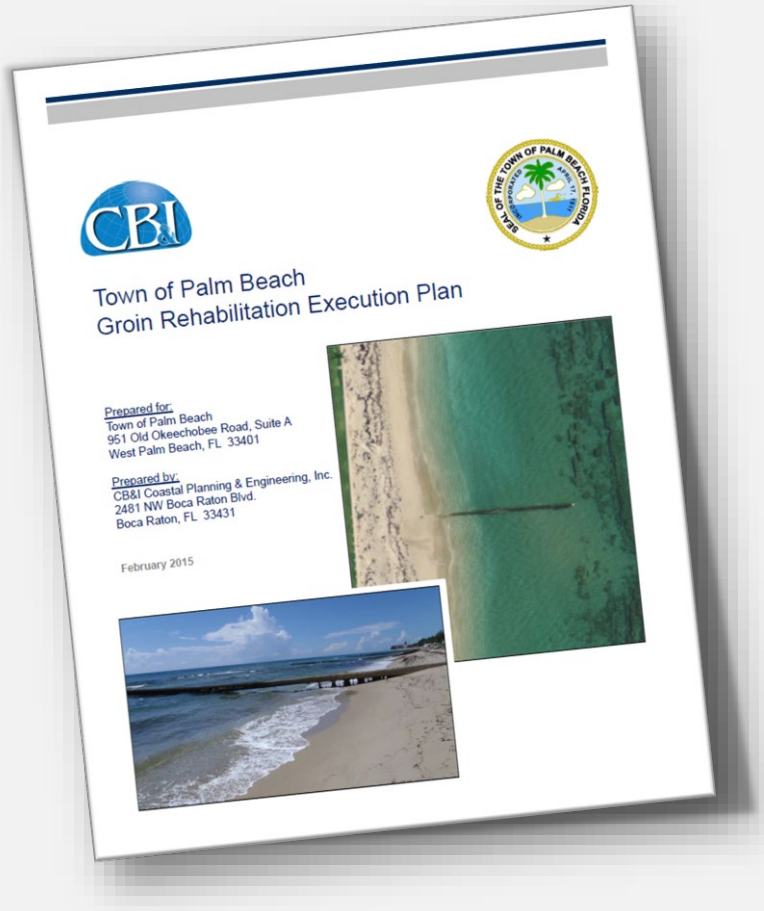
STUDIES COMPLETED FOR PLAN DEVELOPMENT

Study	Date of Site Visit	# of Groins Identified	Contribution
Groin and Armoring Inventory Isiminger & Stubbs Engineering, Inc	November 2009	75	Initial Inventory and Naming System
Coastal Structures Plan Coastal Technology Corporation	June 2010	88	Assessed Historical Performance
Coastal Structures Plan Peer Review Coastal Planning & Engineering, Inc. (now APTIM)	June 2012	96	Peer Review and Independent Assessment
Groin Rehabilitation Execution Plan Coastal Planning & Engineering, Inc. (now APTIM)	July 2014	124	Inventory Update and Development of Execution Plan
Groin Rehabilitation Execution Plan Approval	February/March 2015	Remove 34 Replace 41 (*see note below)	Shore Protection Board Town Council Public Workshop

*Numbers as listed in plan; adjustments expected based on changing conditions, regulatory process, priorities, etc.

Coastal Protection Engineering

EXECUTION PLAN (FEB 2015)



- **Main text describes work completed, structure grouping and phased approach**
- **Appendix A**
  - Aerial plan views of groin locations
- **Appendix B**
  - Site visit report and photo documentation
- **Appendix C**
  - Details of Execution Plan

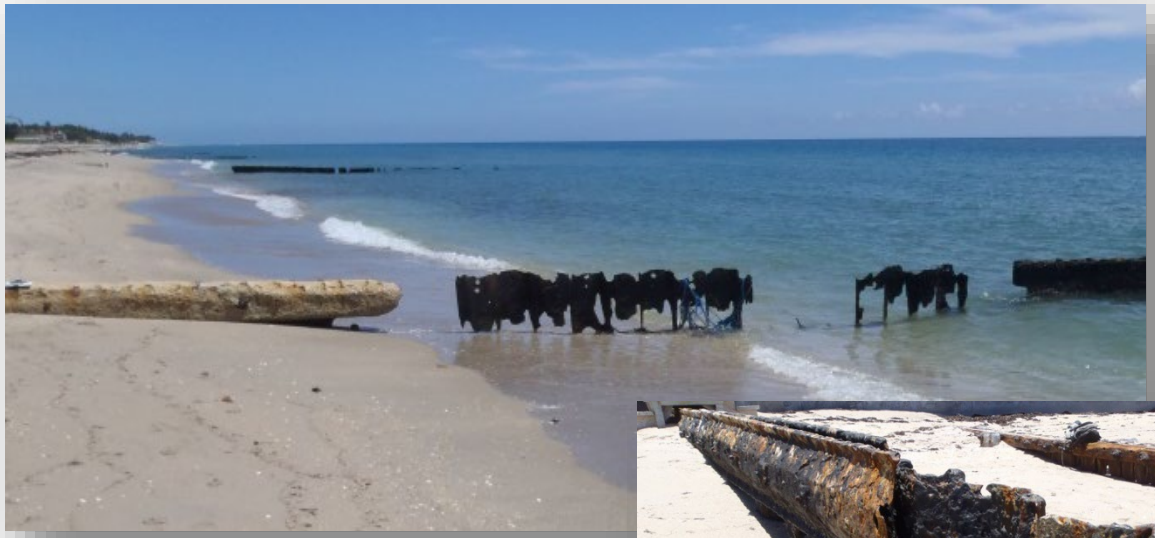
Coastal Protection Engineering

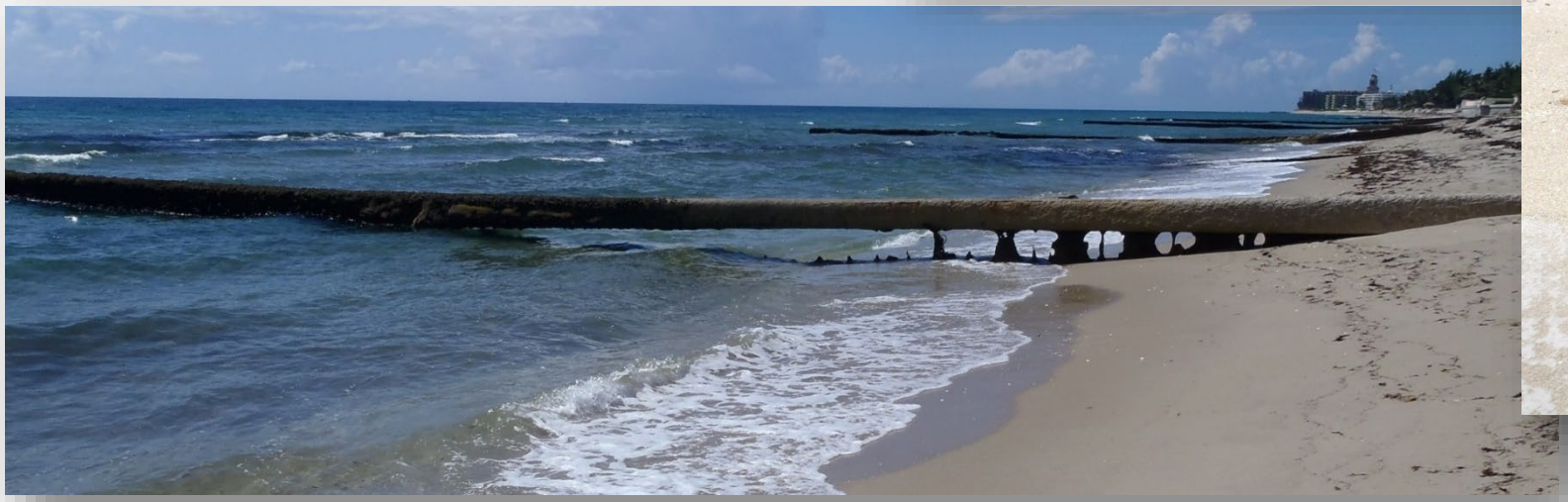
OVERALL FINDINGS

- Existing groins are functioning to varying degrees and are providing benefits in fields or groups.
- Deterioration has led to increased porosity, reduced effectiveness and increased potential safety hazards.
- Unevenly spaced, small groins between other more substantial structures are ineffective.
- Replacement structures should seek similar performance to avoid hardbottom and/or agency restrictions.
- Plan may need to be modified based on agency feedback and actual implementation logistics/costs.

EXISTING MATERIAL COMPOSITIONS & CONDITIONS

- Steel Sheet Pile
- Concrete
- Various conditions





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EXISTING MATERIAL COMPOSITIONS & CONDITIONS

- Timber Piles
- Rock Rubblemound
- Mixed Construction

ASSESSMENT AND IMPLEMENTATION METHODS

- Identify and group by decision matrix (Appendix C)
  - Existing conditions, materials, emergent, ephemeral
- Design intent
  - Existing function, continuity, spacing, safety
- Construction
  - Materials, cost estimates, timing, access
- Permitting approach
  - FDEP (BMA), USACE, NMFS, FWS

- ✓ Plan may be modified based on agency feedback and implementation logistics
- ✓ Phases may extend to multiple construction windows
- ✓ Costs are highly dependent on access and construction methods/materials
- ✓ Adaptive management will be needed

Coastal Protection Engineering

REDUNDANT / INEFFECTIVE STRUCTURE EXAMPLE

TOWN OF PALM BEACH - GROIN REHABILITATION - REACH 2
OBSERVATION REPORT
G72427

Site Visit: June/July 2012

Photo 2. Structure centerline.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

Coastal Protection Engineering

REMOVE / REPLACE STRUCTURE EXAMPLE

TOWN OF PALM BEACH - GROIN REHABILITATION - REACH 2
OBSERVATION REPORT
G72426

Site Visit: June/July 2012

Photo 2. 50-ft south of structure looking north.

Aerial Photography: July 26, 2013

Photo 1. Coastal setting.

COASTAL PROTECTION ENGINEERING

REPLACEMENT: KING PILE AND PANEL GROIN

- Limited footprint
- Customizable lengths and adjustable
- Minimize sea turtle interactions
- Ease of construction (offsite concrete casting)
- Improve aesthetics and reduce hazards

Photograph by Doug Mann, APTIM

INSTALLATION: KING PILE AND PANEL GROIN

- Pelican Landing Community Association Erosion Control Project at Big Hickory Island in Lee County, Florida (2013)

Photographs by Doug Mann, APTIM

Coastal Protection Engineering

RECOMMENDATIONS FROM EXECUTION PLAN

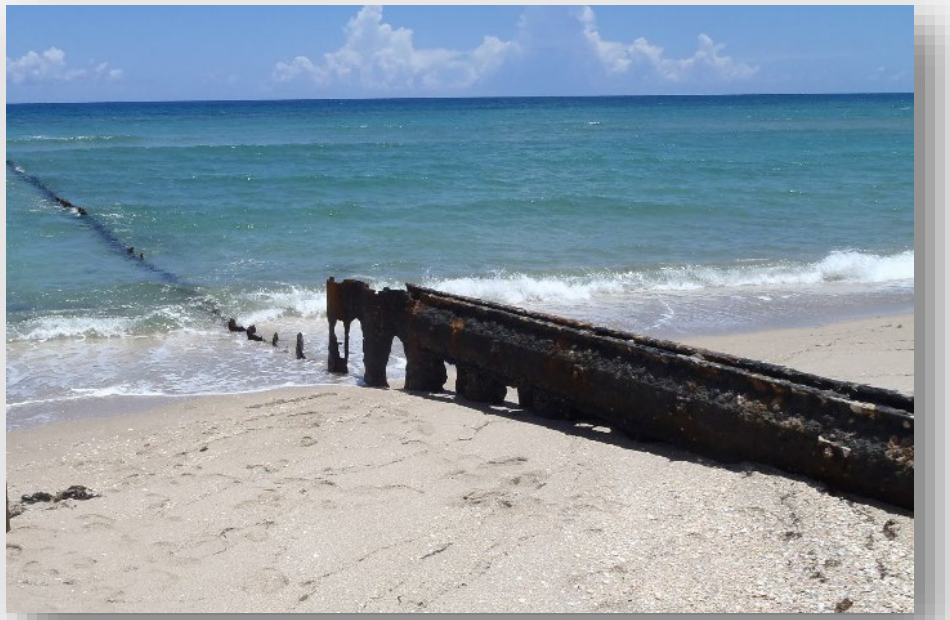
- Maintain current level of function
- Improve aesthetics and reduce hazards
- Implement through phased construction (multiple events)
- Continue beach nourishment program and physical monitoring
- Periodically update structure inventory
- Adaptive management for implementation
- Coordinate with regulatory agencies on permitting approach

Coastal Protection Engineering

ENVIRONMENTAL PERMITTING APPROACH & STATUS

- Department of Environmental Protection (FDEP)
  - Project is authorized under the BMA
  - Proceed with one phase at a time (by season)
  - Coordination on sufficiency determination
  - Issuance of IPA pending any updates/changes
  - Requires U.S. Army Corps authorization

- Army Corps of Engineers (Corps)
  - Authorize all phases in one permit
  - Public Notice (March 2016)
  - Public Comments addressed
  - Engineering review completed
  - FWS & NMFS review completed
  - Department of Army Permit issued Dec 2018



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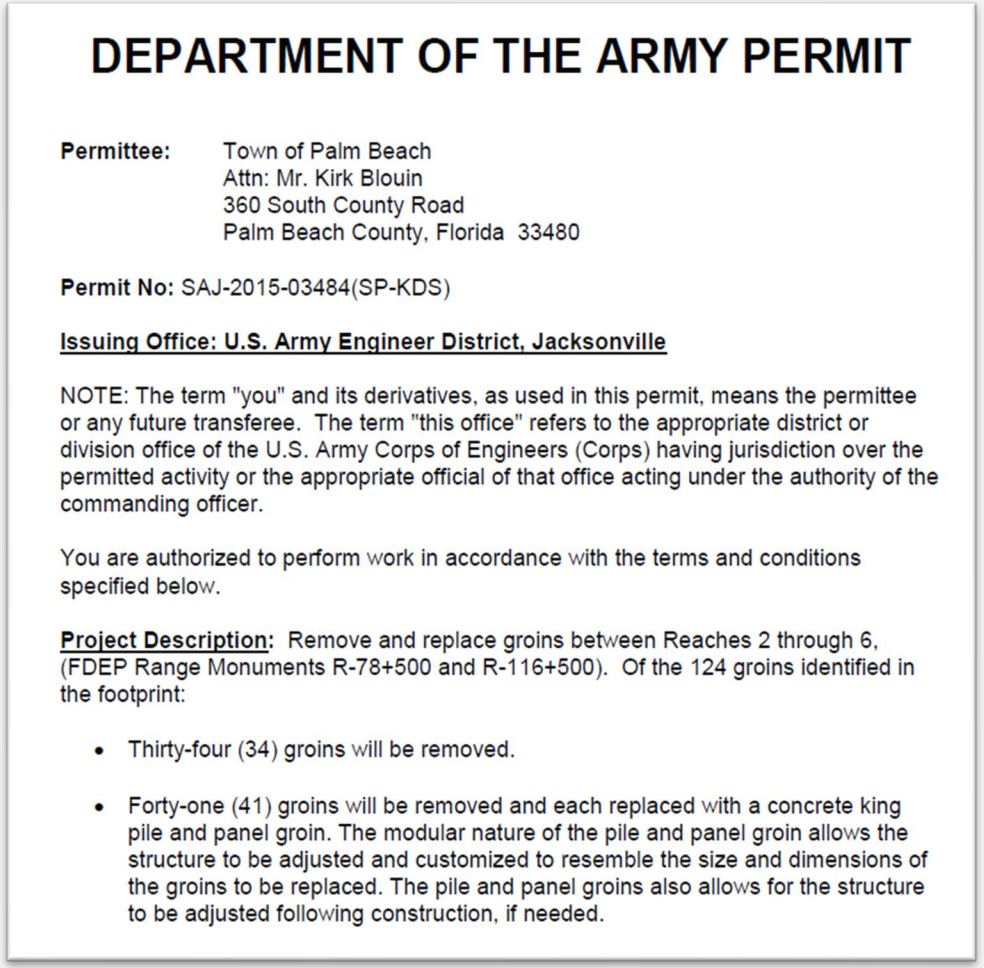
CURRENT GROIN REHABILITATION STATUS

- Plan approved by Town Council
- Permits in place
- Town actions currently on hold
- Private resident implementation being explored



DEPARTMENT OF THE ARMY PERMIT

Permittee: Town of Palm Beach
Attn: Mr. Kirk Blouin
360 South County Road
Palm Beach County, Florida 33480

Permit No: SAJ-2015-03484(SP-KDS)

Issuing Office: U.S. Army Engineer District, Jacksonville

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the U.S. Army Corps of Engineers (Corps) having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: Remove and replace groins between Reaches 2 through 6, (FDEP Range Monuments R-78+500 and R-116+500). Of the 124 groins identified in the footprint:

- Thirty-four (34) groins will be removed.
- Forty-one (41) groins will be removed and each replaced with a concrete king pile and panel groin. The modular nature of the pile and panel groin allows the structure to be adjusted and customized to resemble the size and dimensions of the groins to be replaced. The pile and panel groins also allows for the structure to be adjusted following construction, if needed.

COASTAL PROTECTION ENGINEERING

THANK YOU!

COASTAL HARD STRUCTURE TECHNOLOGY

Shore Protection Board Meeting
April 28, 2022

Thomas Pierro, D.CE, PE
Principal Engineer
Coastal Protection Engineering
tpierro@coastalprotectioneng.com