

**BEACH CONDITIONS AND MANAGEMENT REPORT
BREVARD COUNTY, FL 2007**

*Prepared by Virginia Barker and Mike McGarry
October 22, 2007*

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	2
2.0 DAMAGE ASSESSMENT	2
2.1 DAMAGE ESTIMATES.....	2
2.1.1 MID REACH	3
2.1.2 SOUTH BEACHES.....	3
2.2 STRUCTURES AT RISK.....	4
3.0 IMMEDIATE PUBLIC ASSISTANCE	4
3.1 DECLARED EMERGENCY.....	4
3.1.1 FEDERAL/FEMA ASSISTANCE	4
3.1.1.1 FEMA CATEGORY B ASSISTANCE	5
3.1.1.2 FEMA CATEGORY G ASSISTANCE	5
3.1.2 STATE/DEM GRANTS	5
3.1.3 STATE/FDEP GRANTS	5
3.1.4 HOME AND BUSINESS DISASTER LOANS	5
3.2 NONDECLARED EMERGENCY.....	6
3.2.1 FEDERAL SHORE PROTECTION PROJECT	6
3.2.2 FDEP ASSISTANCE	7
4.0 PRIVATE ACTIONS	7
4.1 SAND PLACEMENT.....	8
4.2 ENGINEERED SAND BAG SYSTEMS	8
4.3 RIGID COASTAL ARMORING	10
4.4 RETREAT.....	11
5.0 LONG-TERM MANAGEMENT PROJECTS	12
5.1 NORTH AND SOUTH REACH SHORE PROTECTION PROJECTS	12
5.2 MID REACH STATUS	13
5.2.1 ACOE SELECTED PLAN	14
5.2.2 LOCALLY PREFERRED PLAN.....	14
5.2.3 MID REACH COST SHARING.....	14
5.3 SOUTH BEACHES ECONOMIC ANALYSIS.....	14
5.4 FUNDING OPTIONS.....	16
5.4.1 TDC ALLOCATION	17
5.4.2 COMMERCIAL PAPER.....	17
5.4.3 BEACH AND SHORE PRESERVATION DISTRICTS	17
5.4.4 BEACHSIDE SET-ASIDE.....	18
5.4.5 PRIVATE PROPERTY OWNER VOLUNTARY PARTICIPATION.....	18
5.4.6 MSBU/MSTU	18

1.0 INTRODUCTION

On October 9th the Board of County Commissioners heard testimony from several beachfront home and business owners regarding erosion experienced during the week of October 1, 2007 from an unnamed tropical wave. The Board requested a Staff Report on the situation with response options regarding beach erosion and available management options.

This report provides an assessment of the recent erosion damage experienced along the areas currently excluded from the federal shore protection project (Satellite Beach, Indian Harbour Beach and the South Beaches) and reports on the availability of relevant federal and state public assistance programs and private response options. Additionally, staff has reported on Brevard County's long-range beach management strategy for the entire developed shoreline stretching from Port Canaveral to Sebastian Inlet.

2.0 DAMAGE ASSESSMENT

On Monday October 1, 2007, beach inspections were conducted to determine the extent of erosion caused by the previous three days of relatively strong northeast winds. Spot checks were performed throughout the South Beaches and the Mid Reach proceeding from south to north. Due to the continuation of easterly winds, a second series of observations were completed the morning of Tuesday October 2, 2007. On the afternoon of October 2nd, a call was received from the manager of the Sandy Shoes Hotel explaining that this property at 3455 Highway A1A, Melbourne Beach had been subjected to significant erosion. A site visit was made to this and adjacent properties on Tuesday afternoon.

Strong east winds returned Friday October 5th and continued during the weekend. On Sunday October 7th, additional beach inspections were conducted to assess additional damage that occurred during the weekend. Wind and sea condition moderated after October 8th allowing a comprehensive assessment to be completed for the entire length of beach in the South Beaches and Mid Reach. GPS waypoints were collected and used to measure the length of segments with various levels of erosion damage. Photographic documentation was as also obtained for each segment along with measurements to calculate erosion losses to the previously constructed emergency engineered berms.

2.1 DAMAGE ESTIMATES

Damage estimates were compiled using observations and measurements collected during the October 11th beach inspection. In all of the areas inspected, the bulk of the erosion was on the eastern edge of the beach itself, not in the engineered berm or dune. In most locations the beach had deflated, or lowered in profile, approximately 2-3 feet. This change in beach profile is normal during periods of large waves, and routinely recovers by natural processes once seas calm. In certain stretches of shoreline, the beach deflation allowed waves to reach, and erode, the engineered berm or dune. Under these conditions, natural processes take much longer to repair dune losses than beach deflation.

Brevard County constructed engineered berms and dunes in 2005 to protect oceanfront structures. This was in response to damage from the 2004 hurricane season. Construction of the berms also sped recovery of the natural dune system. A combination of federal, state and local funds paid for initial project construction. In 2006 the berms were repaired to replace losses incurred during the passage of Hurricane Wilma (2005). Because of a declared federal emergency, FEMA funding (Category G see section 3.1.1.2 below) was available for this repair work. Damage estimates will describe losses to the engineered berm, not deflation of the natural beach.

2.1.1 MID REACH

The engineered berm project in the 7.6-mile Mid Reach is comprised of two components. First is the landward protective berm ("berm"), with a relatively steep slope, constructed along the entire mid reach area. The second component is a supplemental beach (SB) fill constructed in areas that had particularly low beach elevations after the 2004 hurricanes. The SB extends approximately 20 feet seaward of the berm and is a flat but slightly elevated beach area. The SB was constructed to protect the berm from wave action and in most cases has done so successfully.

During the recent erosion event, the entire Mid Reach beach was observed to have deflated 2-3 feet as described in the previous section. In all but a few isolated areas, all of the berm remains intact, while the SB was eroded to varying degrees. The southern two miles (south of Crowne Plaza) saw nearly no project losses. Where minor losses (<10%) occurred, they were on the eastern edge of the SB where a small (<2') escarpment had formed. This escarpment and the associated losses are likely to recover by natural processes.

North of the Crowne Plaza hotel and moving through Indian Harbour Beach and Satellite Beach, erosion to the SB was slightly greater. These areas typically had a 2-3 foot escarpment at the edge of the SB. In most places volume lost from the SB ranged from 10 to 20% of the original project volume. Losses greater than 20% were only seen in areas where berm construction was forced further seaward by privately placed sand or structures. In these discreet areas, more than 80% of the SB is gone and a portion of the berm as well. Overall, approximately 15% of the Mid Reach engineered berm volume has been lost to erosion, however some of this volume may return to the eastern edge of the SB during the natural beach recovery process.

2.1.2 SOUTH BEACHES

The "South Beaches" describes a 14.5 mile stretch between Spessard Holland Park and Sebastian Inlet. The engineered berm project in the South Beaches includes only a protective berm, constructed with a relatively steep slope against the dune bluff. Supplemental beach fill has not been placed here. Most of the erosion in the South Beaches was from the beach itself, not the engineered berm. The beach deflated 2-3 feet in the entire area, but much if this sand is expected to return as part of the natural recovery process. Of the 14.5 mile area, 13 miles (90%) have loss less than 10% of the berm volume placed there. Ninety six percent of the South Beaches have lost less than

20% of the constructed berm volume. Like beach losses, berm losses of <10% and perhaps <20% may be replaced by natural recovery processes.

Significant damage (>20%) to the berm did occur in relatively isolated stretches. Like in the Mid Reach, the berm in some areas was constructed further seaward due to protrusions such as structures (armor, pools or buildings) and/or additional, privately placed sand. Approximately 0.9 miles (or 6%) of the South Beaches lost more than 20% of the engineered berm. Over the entire South Beaches, approximately 8% of the placed volume has been lost from the engineered berm. In these areas of significant erosion damage, at risk structures are sometimes observed.

2.2 STRUCTURES AT RISK

In a few circumstances, both in the Mid Reach and the South Beaches, structures are located very close to the engineered berm, and thus may be in immediate risk because of the recent erosion. These structures are typically older and would not meet current building or siting requirements. Typically, the shoreline has not eroded further landward at these sites compared to neighboring properties, rather the structures were constructed decades earlier. These properties will require more aggressive action, or alternative strategies, to avoid having the structures undermined by erosion.

The study *Economic Analysis of Beach Nourishment Alternatives, South Beaches, Brevard County, FL* (Olsen Associates 2007), described below in section 5.3, presents data identifying 18 structures with 15 feet or less between the structure and the landward edge of the bluff. Of these, most are in areas where the berm was not significantly eroded. Several structures have been removed since the baseline data for the Olsen Associates study was collected. Two of the 18 structures, the Sandy Shoes hotel and the Sea View Hotel, are in areas that were heavily eroded in October 2007 and are likely to require action in the relatively near future to prevent being undermined.

3.0 IMMEDIATE PUBLIC ASSISTANCE

In the event of federal or state emergency declaration, funding and assistance programs are made available to aid in immediate recovery actions and streamlined permitting. Without a declared emergency, applicants typically compete with ongoing projects for funds and follow standard permit review procedures.

3.1 DECLARED EMERGENCY

In order for public assistance programs to be activated making emergency funds available to governments, businesses or individuals, a state of emergency must be declared by the President for federal programs or the Governor for state programs.

3.1.1 FEDERAL/FEMA ASSISTANCE

No Presidential state of emergency was declared for the tropical wave that impacted our coast during late September to early October. For the President to declare a state of emergency, a threshold of at least 100 homes with major damage or destroyed with 40% or more underinsured must be met or exceeded. The most recent federal declaration in Brevard County was after Hurricane Wilma in 2006.

3.1.1.1 FEMA CATEGORY B ASSISTANCE

If a federal state of emergency was declared, owners of major structures vulnerable to a 5 year return interval storm could be eligible for FEMA grants (at variable cost share) to construct emergency berms comprised of up to 6 cubic yards of beach compatible sand per linear foot of shoreline. Category B FEMA berms were constructed by Brevard County in front of all eligible properties in 1999/2000 and 2005.

3.1.1.2 FEMA CATEGORY G ASSISTANCE

If a federal state of emergency was declared, public improvements including properly maintained engineered berms could be eligible for FEMA grants (at variable cost share) to repair damage caused by the declared event. Category G FEMA grants were obtained after Hurricane Wilma to restore the FEMA berms, State Interim Dunes, and County dune stabilization projects that were initially constructed in 2005 after Hurricanes Frances and Jeanne.

3.1.2 STATE/DEM GRANTS

If federal and state emergencies are declared, the Florida Department of Emergency Management (DEM) can provide half of the non-federal match required for FEMA grants. DEM grants were combined with FEMA grants for the construction of the 2005 FEMA berms and the 2006 restoration of the FEMA berms, State Interim Dunes, and County dune stabilization projects.

3.1.3 STATE/FDEP GRANTS

If an emergency is declared by the Governor, either special appropriations are made available (with matching requirements specified by the Legislature) to the Florida Department of Environmental Protection (FDEP) or the FDEP can reallocate up to 25% of the fixed capital outlay funds budgeted for beach nourishment projects in that fiscal year to provide grants for beach and dune restoration projects. In 2005, a FDEP grant was used to fill the gaps between non-contiguous FEMA berms with State Interim Dunes constructed along approximately 21 miles of shoreline in Brevard County's Mid Reach and South Beaches.

3.1.4 HOME AND BUSINESS DISASTER LOANS

For smaller disasters, the Small Business Administration (SBA) Administrator may issue an SBA-only declaration activating two types of disaster loan programs available to homeowners, renters and businesses within designated areas: Physical Disaster Loans and Economic Injury Disaster Loans. Loans are for the repair and rebuilding of disaster losses. SBA is not authorized to provide disaster grants or to forgive the repayment of disaster loans.

The threshold for an SBA Home Disaster Loan Declaration is 25 homes and or businesses with major damage or destroyed and 40% or more underinsured. Economic Injury Disaster Loan declarations require certification from a State Governor that at least 5 small businesses have suffered substantial economic injury (including loss of business income) as the result of a disaster and are in need of financial assistance not otherwise available on reasonable terms. Neither threshold is currently met.

3.2 NONDECLARED EMERGENCY

In the absence of a declared emergency, local governments can request that the U.S. Army Corps of Engineers (ACOE) evaluate the shoreline for establishment of a federal shore protection project and/or compete for grants distributed by FDEP's Bureau of Beaches and Coastal Systems through their Beach Erosion Control Program. These grant funds are prioritized by FDEP approximately one year in advance.

3.2.1 FEDERAL SHORE PROTECTION PROJECT

In 1987, at Brevard County's request, the ACOE completed a reconnaissance level economic analysis for the entire shoreline between Port Canaveral and Sebastian Inlet. That analysis found only a short segment of shoreline in Cape Canaveral to have a federal benefit to cost ratio that exceeded 1.0, thereby potentially eligible for federal assistance. In 1989, the County hired Olsen Associates to update the property values used in the ACOE study and examine more refined shoreline segments. The 1989 Olsen Analysis found shoreline segments in Cape Canaveral, Cocoa Beach, Satellite Beach, and Indian Harbour Beach that met the federal cost benefit ratio requirements and a section near the boundary between Indialantic and Melbourne Beach that exhibited moderate cost benefit.

Based on the results of the 1989 Olsen Analysis, Brevard County requested that the ACOE re-examine the economics of federal shore protection from Cape Canaveral through incorporated Melbourne Beach. In 1996, the ACOE released a favorable draft study for the 9.8-mile North Reach (incorporating Cape Canaveral and Cocoa Beach) the 7.6 mile Mid Reach and a 3.4-mile South Reach (including incorporated Indialantic and Melbourne Beach.) The Mid Reach (Satellite Beach and Indian Harbour Beach) was subsequently excluded from the final report due to environmental concerns, not for lack of economic justification.

The ACOE's favorable 1996 study led to Congressional authorization of the North and South Reach projects that were initially constructed in 2000-2001 and 2002-2003 respectively. Approximately 14 years passed between 1986 when the County requested an ACOE analysis and initial construction of the North Reach and 16 years before construction of the South Reach. The Mid Reach is still awaiting a favorable feasibility report. A survey of other ACOE projects in Florida confirms similar 12-20 year timetables for the projects approved to date. Requesting a federal project in the South Beaches, regardless of the economics, would inevitably require a similar time period for review.

The value of inclusion in a federal shore protection project is the potential for up to 65% federal cost share. But much of this benefit is eroded by the additional local cost share required for the ACOE to complete the multitude of required federal studies, and the increased cost of consultants and contractors required to navigate the extensive federal process to plan, permit, and construct the project. For the South Beaches, the fiscal benefits of federal partnership may be minimal, especially in light of a probable 10-year construction delay.

3.2.2 FDEP ASSISTANCE

Florida's Beach Erosion Control Program provides financial assistance to Florida's county and municipal governments, community development districts, or special taxing districts in an amount up to 50 percent of non federal project costs for shore protection and preservation activities consistent with the adopted Strategic Beach Management Plan and located on the Gulf of Mexico, Atlantic Ocean, or Straits of Florida.

Beach nourishment is the Legislature's preferred way to address a sand-starved system because it provides a significant level of storm protection benefits for upland properties and is the least impacting to the coastal system. Additional benefits of beach restoration projects include enhanced recreation opportunities and potential restoration of shorebird and marine turtle nesting habitat.

As stated in Florida Statute 161.101 (14), it is the intent of the Legislature "to direct beach erosion control appropriations to the state's most severely eroded beaches, and to prevent further adverse impact caused by improved, modified, or altered inlets, coastal armoring, or existing upland development." Legislated criteria are used by FDEP to determine annual funding priorities. Based on these ranking criteria, the severity of erosion in Brevard, and the project proposals we have submitted to date (since 1999), FDEP has provided over \$24 million to Brevard County.

4.0 PRIVATE ACTIONS

Per the Coastal Element of the Comprehensive Plan, private property owner response to erosion in unincorporated Brevard County consists of placement of beach-quality sand from an upland source to repair and stabilize their dune, installation and maintenance of an engineered geotextile sandbag systems, repair of minor damage to existing (currently non-conforming) seawalls or rock revetments, or retreat from the eroding bluff line. There is also a provision to allow new rigid armoring through unanimous Board action to amend the comprehensive plan.

Beach nourishment, dune restoration, the landward relocation of structures and coastal armoring can be effective strategies to mitigate the effects of coastal erosion. However, in areas of existing erosional stress, such as critically eroding beach systems, rigid coastal armoring causes increased erosional stress on the beaches fronting the armoring and those adjacent to it. Based on published data, Coastal armoring may also negatively impact the integrity and natural functioning of the beach and dune system, and may also increase the vulnerability of adjacent unarmored properties to storm damage and other seasonal erosion events (source FDEP: <http://www.dep.state.fl.us/beaches/publications/pdf/bcap.pdf>). Seawalls can also interfere with marine turtle nesting activities.

Federal, state, and local regulations govern activities on beachfront properties in order to balance property protection, beach and dune ecological and recreational sustainability and ensure reasonable use of private property. Improperly sited and designed structures can destabilize or destroy the beach and dune system. Once destabilized,

valuable natural resources are lost which are important for recreation, upland property protection and environmental habitat.

4.1 SAND PLACEMENT

Sand placement is the preferred response of regulatory agencies to address sand-starved systems because sand provides storm protection benefits for upland properties and is the least impacting to the coastal system. Permitting requirements for individual dune restoration or stabilization projects are relatively simple¹. Private property owners need a consistency letter from Brevard County's Natural Resources Management Office (NRMO) and a field-permit from FDEP. Following the 2004 hurricanes, NRMO issued 180 consistency letters for sand placement. NRMO received no requests to update these letters after Hurricane Wilma. Five letters have been updated this month.

In response to requests for assistance received on October 2nd, staff worked with property managers at 3435 and 3455 (Sandy Shoes Hotel) to assist them in obtaining a state permit to place sand immediately. Staff provided recommendations on the most practical, cost effective and permissible options of placing sand on the properties. After the property managers submitted their permit requests to FDEP, staff contacted FDEP to assure the applications would get immediate attention. The county coordinated communication between local turtle monitors and regulatory agencies to confirm sand placement could be accomplished without harming marine turtle nests and this information was provided to FDEP. County staff agreed to a FDEP request to perform sand inspection on behalf of the state, in order to expedite installation. The residents had permits in hand by Friday October 5th and a sand sample was inspected late Friday afternoon. This series of actions by property managers and county staff provided owners a permitted option to immediately protect their properties as necessary.

The cost of sand purchase and placement in the South Beaches has recently ranged from \$25-\$30 per cubic yard. Typical volumes placed range from 2 to 6 cubic yards per lineal foot of shoreline amounting to a cost of \$50-\$180 per foot of shoreline.

4.2 ENGINEERED SAND BAG SYSTEMS

In 2005, the Board recognized that alternatives to rigid coastal armoring were necessary that did not have the same negative impact to the beach and dune system, nor increase the vulnerability of adjacent unarmored properties to storm damage. Consequently, the Board authorized, under certain conditions, the installation of engineered sand bag systems buried in the dune beneath enough sand cover to support sea turtle nesting thereby minimizing the interference with marine turtle nesting activities.

Under the engineered sandbag provisions, when the Board of County Commissioners determines that a major structure is vulnerable to collapse in the event of a 15-year return interval storm, the Board may direct staff to issue a consistency determination letter to the FDEP for sandbag systems. The consistency letter shall also indicate the

¹ Note that larger dune projects require a Coastal Construction Control Line permit with engineered plans and projects that extend below the mean high water or involve sand obtained from an offshore source require a joint coastal permit issued by FDEP and the U.S. Army Corps of Engineers.

Board's preference that setbacks or other non-structural methods of shoreline protection be given the highest priority as the preferred means of addressing vulnerable structures.

Per Section 62-4201 of the Brevard County Code, such shoreline protection measures shall be designed and constructed as to:

- (1) Minimize adverse impacts to the naturally functioning beach and dune system,
- (2) Minimize adverse impacts to adjacent properties, and
- (3) Be designed and constructed to not impede public access to or along the shore.
- (4) Avoid any adverse impact to marine turtles or their nesting habitat. Such avoidance shall require the perpetual maintenance of the necessary sand above and seaward of any board approved shoreline protection project to avoid turtle impacts. Failure of the property owner to maintain this sand buffer shall constitute a violation of this article.
- (5) Any application for a consistency determination letter authorized under this ordinance shall constitute an applicant's consent for the county to record a notice of the conditions incorporated into the consistency determination. The conditions incorporated into the consistency determination may be enforced against the applicant and successor in interest to the applicant.

In response to the 2004 hurricane season, Brevard County negotiated and executed an Order of Delegation with FDEP for enforcement of the local provisions stated above as well as special conditions included in FDEP's permits. As a result of this, NRMO issued 44 consistency letters for experimental installations; however, there were only 6 actual installations: three at single family residences and three at condominiums. There were approximately 12 applicants who requested consistency letters but were found to be ineligible. NRMO rescinded eight consistency letters for sand bag systems that were issued based on inaccurate information supplied by the applicants.

Geotextile sand bag purchase, engineering, permitting, and installation with required sand cover ranged in cost from \$600-800 per lineal foot of shoreline. To date, maintenance of the required sand cover over the engineered sand bag systems has been relatively difficult and expensive for those sand bag installations that were sited across the intersection of the beach and dune, yet relatively inexpensive at installations sited entirely underneath the dune. Whereas one homeowner has never had to replace sand cover over the system installed at her property, one condominium has reported spending \$20,000 to \$40,000 two to three times per year to maintain the sand required for turtle nesting.

Another installation was voluntarily removed this spring by an owner whose home was condemned due to prior damage. The owner determined that the cost of turtle monitoring and maintaining sand cover over the system outweighed the benefit of protecting the remaining vacant lot. The annual cost of monitoring turtle nesting impacts ranges from \$1100-\$5800 per site depending on the length of the installed system.

Based on the apparent physical and biological performance of these systems in Brevard County and several other locations, the Florida Legislature adopted more stringent state standards for future installations. Local governments no longer have authority to approve the temporary installation of geotextile sandbag systems during a declared emergency. All future installations must be pre-approved by FDEP.

FDEP has also commissioned a study of the geotextile sandbag systems remaining in Brevard County to determine the level and character of storm protection provided by these installations in their current configurations. At Brevard County's request, initiation of this study was expedited in order to measure the physical responses of the beach and dune to the early October tropical wave. The study will be ongoing for three years.

4.3 RIGID COASTAL ARMORING

Brevard County has declared that "it is in the public interest to preserve and protect the county's coastal barrier beach-dune system from imprudent construction, which would jeopardize the stability of the beach-dune system, accelerate erosion, provide inadequate protection to upland structures and endanger adjacent properties" (Brevard County's Coastal Ordinance, Chapter 62, Article XII). The code discourages "further construction of rigid coastal and shore protection structures [because] rigid coastal and shore protection structures, such as seawalls, bulkheads, revetments and mound structures, block the movement of sand from the dunes to the beach, thereby preventing the natural renourishment of the sandy beaches."

According to the Comprehensive Plan, Coastal Element, Policy 4.1 and codified in the Coastal Ordinance Section 62-4213 regarding structures seaward of the coastal setback line:

(d) No new rigid coastal armoring or shoreline hardening structures shall be permitted in unincorporated Brevard County south of Patrick Air Force Base (PAFB) property or within the Archie Carr National Wildlife Refuge, unless an emergency amendment to the coastal management element of the county comprehensive plan authorizing the construction of such a structure is approved by the board of county commissioners in accordance with the review procedures applicable to such emergency comprehensive plan amendments as set forth in section 163.3187(a) Florida Statutes.

(e) North of the PAFB, no new shoreline hardening structures should be permitted unless an emergency exists.

Emergency amendments to the comprehensive plan require a unanimous vote of the County Commission and approval by the Florida Department of Community Affairs. Applicants must demonstrate that they have a major structure that is in danger of "imminent collapse." Coastal Ordinance Section 62-4201 defines imminent collapse as follows:

...the foundation of a structure will fail due to its own weight under normal conditions, resulting in structural damage to the supported structure. This shall be determined by modeling dune erosion anticipated to result from a 15-year return

interval storm. Such modeling must be calibrated to the site conditions and performed by a professional engineer licensed in the state, with demonstrated competency in coastal engineering.

If the applicant demonstrates vulnerability, and the County Commission unanimously approves a change to the comprehensive plan, and the Florida Department of Community Affairs approves the change, then the property owner can receive a consistency letter from NRMO necessary to apply for a state permit for coastal armoring.

Florida Administrative Code Chapter 62B-33 provides design and siting requirements that must be met to obtain a permit for coastal armor from FDEP. Approval or denial of a permit application is based upon a review of the potential impacts to the beach dune system, adjacent properties, native salt resistant vegetation, and marine turtles. For projects that could adversely impact turtle nesting beaches, FDEP consults with the Florida Fish and Wildlife Conservation Commission. Some projects also require an Incidental Take Permit issued by the U.S. Fish and Wildlife Service.

4.4 RETREAT

Managed retreat can comprise "setbacks," rolling easements and other planning tools including building within a particular design life. Brevard County's Coastal Ordinance Section 62-4205 establishes a coastal construction control line "to define that portion of the beach-dune system which is subject to severe fluctuations based on conditions associated with a 100-year storm event, and to employ special construction standards for structures to be located seaward of the coastal construction control line, so as to protect the structures from the perils of storm and sea." It also establishes additional "setback requirements to provide that structures located on oceanfront property be set back sufficiently and constructed in a manner so as to provide a useful life thereof, considering the perils of storm and sea."

For nonconforming structures, Section 62-4207 (4) states:

Any portion of a structure, seaward of the coastal setback line, that is undermined by erosion cannot be modified, maintained or repaired and must be removed. The remaining portion of the structure may be modified, maintained or repaired provided that:

The seaward most portion of the structure is sufficiently setback from the crest of the dune to provide protection from being undermined by erosion resulting from a 25-year storm event;

The protection determination, as outlined in Section 62-4207 (4)(a), is sealed by a professional engineer and submitted to the county for review;

And, in no event shall modification, maintenance, or repair to a structure that has been undermined be permitted closer than fifteen (15) feet landward of the crest of dune.

In addition, Policy 4.1 G of the Coastal Element of the Comprehensive Plan states:

Reconstruction of existing hard erosion control structures which are more than fifty (50) percent destroyed should be considered new construction and should be regulated as such, except for the maintenance of existing public navigational projects, such as Port Canaveral and Sebastian Inlet.

Staff will be requesting clarification from the Board during an upcoming meeting regarding the Board's intent relative to assessing "percent destroyed" for hard erosion control structures under this policy.

5.0 LONG-TERM MANAGEMENT PROJECTS

Brevard County actively sponsors multi-agency partnerships to provide long-term management for its most developed shorelines – from Port Canaveral through each incorporated area to Spessard Holland Park at the north end of the South Beaches. Nearly 14 miles of beach benefit from an ongoing 50-year agreement between Brevard County and the federal government to maintain a nourished beach. Another 7.6-mile stretch is in the final stages of a feasibility study to join in the County's 50-year agreement with the ACOE to nourish and maintain the beach. A recent study funded jointly by the County and FDEP re-examines the economic feasibility of beach nourishment along the remaining developed shoreline. To date, the Local Option Tourist Tax (hotel/motel bed tax) has provided the total local cost share for these long-term beach management projects.

5.1 NORTH AND SOUTH REACH SHORE PROTECTION PROJECTS

Prior to initial nourishment, the North Reach (stretching 9.8 miles from Port Canaveral to Patrick Air Force Base) and the South Reach (stretching 3.8 miles through Indialantic and Melbourne Beach) were critically eroded with many structures vulnerable to imminent collapse and some undermined by erosion. The County sought to remedy this situation through federal and state partnerships to replace the sand that had eroded from these beaches by bringing in beach-compatible sand from offshore sources and by renourishing the shore protection berm as needed.

On April 20, 2000, after years of planning, negotiation and multiple acts of Congress, Brevard County executed a Project Cooperative Agreement with the Department of the Army to construct and renourish the North and South Reach project areas, as needed for 50 years. Based on land use codes and development status, the federal cost shares for the North and South Reaches were established as 62.14% and 56.31% respectively. Through multiple other grant contracts with FDEP, the state provided 50% of the non-federal costs for initial construction, and based on the availability of public access, continues to provide 47.64% of the non-federal costs for monitoring and maintenance. The TDC has provided the local cost share, thus far amounting to about \$11 million.

Physical performance of the North and South Reaches is measured annually and has been exemplary. As of June 2004, prior to the 2004 hurricane impacts, survey data for the North Reach indicated that of the 3,138,300 cubic yards placed in 2000-2001, there was a loss of only 105,600 cubic yards on the beach above the mean high water line and an overall gain of 61,000 cubic yards above the -16 ft-NGVD elevation contour.

Similar survey data for the South Reach indicated that of the 1,541,500 cubic yards placed in 2002-2003, there was a loss of 145,400 cubic yards across the active profile.

During the 2004 hurricane season, the projects suffered significant volumetric losses, however no major structures were lost and few dune crossovers were damaged. Outside the nourished project areas, multiple homes and businesses were undermined by erosion. Several collapsed onto the beach. Several private seawalls failed and all but two of the dune crossovers at public parks were damaged or destroyed. In 2005, the ACOE contracted to replace storm losses within both project areas at 100% federal cost share.

Despite Hurricane Wilma in 2005, volumetric change measured in May 2006 along the entire North Reach amounted to a gain of 975,300 cubic yards above the -17.4 ft-NAVD elevation. It appears that of the estimated 1.15 million cubic yards eroded from the project area during the 2004 hurricane season, most of it returned to the active profile within one year and may continue to work its way back to the beach. Similarly, gains along the active profile of the smaller South Reach amounted to 244,400 cubic yards despite a 25-30 ft narrowing of the dry beach.

5.2 MID REACH STATUS

Brevard County has been pursuing a federal shore protection project along the Mid Reach (including Satellite Beach and Indian Harbour Beach) for over 20 years. The process for obtaining an authorized federal project involves four stages: Reconnaissance, Feasibility, Pre-construction Engineering and Design (PED), and Construction. The Mid Reach is currently in the Feasibility stage.

As discussed in section 3.2.1 above, the ACOE's initial 1987 Reconnaissance Report was unfavorable. After Olsen Associates completed a more detailed and updated 1989 analysis for the County, the ACOE produced a favorable Reconnaissance Report for the entire shoreline from Port Canaveral through incorporated Melbourne Beach. The ACOE then proceeded with a Feasibility Study. Due to environmental concerns regarding the nearshore rock resources along the Mid Reach, the ACOE's 1996 Feasibility Study omitted the Mid Reach. While the North Reach and South Reaches moved on to PED, the Mid Reach required more study.

In January 2003, Olsen Associates completed an "Assessment of Nearshore Rock and Shore Protection Alternatives Along the Mid Reach of Brevard County." This report was delivered to the ACOE to expedite their General Re-evaluation Report (GRR), a new feasibility analysis for the Mid Reach. Completion of the GRR is now anticipated in 2008 with the possibility of construction in November 2010, pending Congressional authorization and appropriations.

As part of the GRR, the ACOE has been performing a tradeoff analysis, including a National Economic Benefit Analysis, to determine the Federal "Selected Plan" for shore protection in the Mid Reach. The analysis reduced a large list of alternatives down to a single Selected Plan. When the ACOE's cost estimating is complete, the County can

either accept the Corps's Recommended Plan or ask for a different "Locally Preferred Plan." The project will then undergo State Clearinghouse review, federal NEPA review, review by the Secretary of the Army (Civil Works), and Congressional authorization via a Water Resources Development Act (WRDA) bill.

5.2.1 ACOE SELECTED PLAN

The ACOE's tentatively selected plan is a truck hauled beach project which will raise the elevation of the current beach and extend the waterline seaward 10+ feet along the southern 6.24 miles of the Mid Reach. The northern 1.36 miles (North of Patrick Drive at Hightower Park) where rock coverage is densest, will receive a dune fill project without extension of the waterline. The project will be constructed using beach quality sand dredged from offshore and stockpiled at the Poseidon Dredged Material Management Area at Port Canaveral and transported to the Mid Reach by truck.

5.2.2 LOCALLY PREFERRED PLAN

The County has proposed a locally preferred plan that requires approximately 0.3 more acres of rock impact, but doubles the average shore protection benefits of the ACOE's tentatively selected plan. The locally preferred plan consists of a tapering hydraulic nourishment project that would extend 1.4 miles north from the South Reach and tie into a truck hauled beach project that would raise the elevation of the current beach and dune with minimal seaward extension of the waterline along the next 4.8 miles of the Mid Reach. The northern 1.36 miles (North of Patrick Drive at Hightower Park) where rock coverage is densest, will receive a dune fill project without extension of the waterline exactly as proposed by the ACOE.

5.2.3 MID REACH COST SHARING

Once the Mid Reach project is authorized by Congress, the ACOE can proceed with PED and the County will enter a 50-year Project Cooperative Agreement with the Corps for the Mid Reach and seek Congressional appropriations for construction. Federal cost share is anticipated to be approximately 60% for all 50 years. FDEP would provide 16% (40.53% of the non-federal cost), leaving the County to pay 24% of project costs.

The estimated local cost of the tentatively selected plan is slightly more than the TDC's Mid Reach budget allocation; however, the Water Resources Development Act (WRDA) approved by Congress in September and currently pending ratification by the President proposes to reimburse previous local cost share for the North Reach by providing an approximate \$5 million cost credit toward the next project, presumably Mid Reach construction.

5.3 SOUTH BEACHES ECONOMIC ANALYSIS

As part of the County's response to the 2004 hurricanes, the County requested a state grant to cost share in a new cost/benefit analysis of the South Beaches to examine the feasibility of the area qualifying for a federal shore protection project. FDEP approved the request and a grant agreement was executed on May 8, 2007. A task order was issued to the County's coastal engineering consultant, Olsen Associates, and up-to-date tax roll information was obtained from the Property Appraiser for the analysis. Work

proceeded immediately and steady progress continued through the summer. After the tropical wave, staff asked Olsen Associates to expedite completion of the study. The final report arrived October 16, 2007.

The study examines the predicted costs and storm damage reduction benefits associated with beach nourishment alternatives along the 14.5-mile shoreline of the South Beaches. The analysis does not include incidental benefits such as recreation, environmental resource protection, commercial revenues and employment. The Property Appraiser's data indicates 643 oceanfront parcels in the study area of which 388 included major oceanfront structures. The market value of the 643 parcels (including structures) sums to approximately \$665 million.

The study identifies 21 properties comprising 2510 feet of shoreline that have major structures that are vulnerable to a 15-year return interval storm. It notes two structures less than 10' from the landward edge of the dune bluff. In the absence of action, erosion damages over the next ten years are predicted to reach approximately \$35 million. These threatened structures are loosely clustered along several segments of shoreline divided by non-threatened properties and conservation lands.

The study's economic analysis indicates that for a 10-year planning horizon, only the northern 9550-foot segment of the South Beaches (Segment A) exhibits a positive benefit-to-cost ratio (1.11) for beach renourishment (Table 5 copied from "Economic Analysis of Beach Nourishment Alternatives, South Beaches, Brevard County, FL"). Another 2.2-mile segment (Segment C) exhibits a less immediate but positive benefit-to-cost ratio (1.03) if analyzed over a 15-year planning horizon (Table 6 copied from "Economic Analysis of Beach Nourishment Alternatives, South Beaches, Brevard County, FL").

Table 5.

Predicted Costs and Storm Damage Reduction Benefits for 6 Contiguous Shoreline Reaches for a 40-cy/ft one-time beach nourishment project (10-Yr Analysis Horizon)							
Reach	Approx. R-Monument Range			Reach Length (miles)	40 -cy/ft Project		
					Benefits	Cost	Benefit to Cost Ratio
					(\$ 1000's)	(\$ 1000's)	B/C
A	R-139.0	to	R-149.3	1.81	\$ 6,893	\$ 6,227	1.11
B	R-149.3	to	R-164.5	2.71	\$ 3,882	\$ 9,384	0.41
C	R-164.5	to	R-176	2.18	\$ 5,645	\$ 7,830	0.72
D	R-176	to	R-193.0	3.15	\$ 5,559	\$ 11,647	0.48
E	R-193.0	to	R-200	1.29	\$ 2,547	\$ 4,966	0.51
F	R-200	to	R-219	3.40	\$ 386	\$ 13,119	0.03

Table 6.

Predicted Costs and Storm Damage Reduction Benefits for 6 Contiguous Shoreline Reaches for a 40-cy/ft one-time beach nourishment project (15-Yr Analysis Horizon)							
Reach	Approx. R-Monument Range			Reach Length (miles)	40 -cy/ft Project		
					Benefits	Cost	Benefit to Cost Ratio
					(\$ 1000's)	(\$ 1000's)	B/C
A	R-139.0	to	R-149.3	1.81	\$ 8,607	\$ 6,227	1.38
B	R-149.3	to	R-164.5	2.71	\$ 4,239	\$ 9,384	0.45
C	R-164.5	to	R-176	2.18	\$ 8,039	\$ 7,830	1.03
D	R-176	to	R-193.0	3.15	\$ 6,682	\$ 11,647	0.57
E	R-193.0	to	R-200	1.29	\$ 2,800	\$ 4,966	0.56
F	R-200	to	R-219	3.40	\$ 378	\$ 13,119	0.03

The study also provides cost estimates for construction small- to large-scale beach renourishment projects along the two most vulnerable shoreline segments of the South Beaches. Initial beach nourishment along Segment A is estimated to cost \$6.2 - \$12.2 million to place 40 - 80 cubic yards of sand per lineal foot of shoreline. Initial nourishment of Segment C is estimated to cost \$7.5 - \$15 million for 40-80 cy/lf. Neither estimate includes permitting, engineering or monitoring costs. If the County were to pursue beach nourishment along either segment, the exact project lengths and locations could be refined to maximize shore protection as well as incidental benefits.

Dune stabilization projects, similar to the engineered berms constructed along most of the South Beaches in 2005 are cost-feasible throughout the South Beaches once every five years, and once every 3 years along the two most vulnerable segments. The South Beaches portion of this project cost approximately \$7.4 million in 2005. If federal or state emergency funds become available to restore erosion losses, then more frequent local action becomes economically feasible.

5.4 FUNDING OPTIONS

Funding options considered below include: a summary of the TDC's current revenue stream, balance, and commitments for the Beach Improvement Fund; status of the County's unobligated loan capacity for commercial paper; Board authority for enacting a Beach and Shore Protection District levy; the potential for establishing a real estate sales tax percentage allocation; the feasibility of collecting pro-rata project costs from voluntary project participants; as well as MSBU and MSTU options.

5.4.1 TDC ALLOCATION

The Tourist Development Council (TDC) Beach Improvement Fund is fully engaged in providing the local cost share of the federal North, Mid and South Reach projects. The County's 50-year Project Cooperative Agreement with the Army Corps of Engineers for the North and South Reaches encumbers most of the fund's projected revenues through the year 2050. In addition to meeting the County's obligation to the National Treasury for the local cost share of the North and South Reach projects, the TDC's long-term financial plan allocates \$11.4 million for initial restoration of the Mid Reach in 2010.

The fund needed \$2 million in commercial paper to complete initial restoration of the South Reach in 2002-2003 and another \$3 million of commercial paper in 2005 to expand the emergency Mid Reach dune stabilization project. The 5th cent tax, approved in 2005, allowed for a reallocation of other program funds that increased revenues to the Beach Improvement Fund by about \$300,000 annually. Total annual revenues are currently about \$1.6 million.

5.4.2 COMMERCIAL PAPER

Prior commitments and loans needed for multiple 2004 hurricane recovery efforts depleted the county's remaining bonding capacity. There is currently no ability to incur more debt. To increase loan capacity, the County would need to petition the Florida Local Government Finance Commission. For reference however, debt payments on a \$10 million loan to be repaid over a 6-8 year estimated project life would be \$1.5 - \$2 million per year.

5.4.3 BEACH AND SHORE PRESERVATION DISTRICTS

Florida Statutes, Chapter 161, Part II establishes County beach and shore preservation authorities to carry out beach and shore preservation programs. The board of county commissioners of any county are "constituted as the beach and shore preservation authority for their county." As the governing body, they may "levy upon all taxable property within each district an ad valorem benefits tax in any amount necessary to meet the requirements of the program but not exceeding the reasonable ability of the district to pay."

According to FS 161.37:

(2) The tax shall be levied upon each taxable property in proportion to benefits said property will receive as determined by the most recent economic analysis of the program as provided for under s. 161.29. General benefits shall be uniformly applied on an ad valorem basis to the entire assessed valuation of each district, while special benefits shall be assigned to groups of specific properties which shall constitute zones because of the equal or comparable benefits each included property will receive.

(4) The owner of lands where a special benefits tax is proposed to be levied shall be given written notice and an opportunity to be heard upon the amount of special benefits tax to be levied upon his or her lands.

Additionally, the "board of county commissioners may receive guidance from an advisory group, consisting of not less than three nor more than five persons, which the board of county commissioners may appoint from any or each such district. Members of such advisory group shall have no definite term of office but shall serve at the pleasure of the board of county commissioners." Brevard County's Beach Erosion Advisory Committee was established for this purpose but a special benefits tax has never been levied.

5.4.4 BEACHSIDE SET-ASIDE

Beachfront property owners have previously suggested that the Board consider funding beach projects via a real estate sales tax percentage allocation. The Board could use the relatively high values of beachfront properties to justify setting aside a percentage of their ad valorem revenues specifically for beach projects. This does not collect additional revenue, but reallocates existing resources.

5.4.5 PRIVATE PROPERTY OWNER VOLUNTARY PARTICIPATION

For dune stabilization projects, the local share of beach management costs could be collected voluntarily based on pro-rating the cost per foot of shoreline owned by each participating property owner. For a project the scale of the 2005 emergency engineered berm, the approximate cost would be \$130 per linear foot (i.e. \$13,000 for a typical 100-ft wide property). Property owners would need to notarize construction easements, and submit payments prior to advertisement of the construction bid.

5.4.6 MSBU/MSTU

A Municipal Service Benefit Unit (MSBU) would provide a means for Brevard County government to provide financing for individuals to cover the local share of project costs and would allow individual property owners to opt out of the project.

A Municipal Service Tax Unit (MSTU) requires an election and approval by a majority vote. If approved by the electorate, an MSTU would provide financing for individuals to cover the local share of project costs but would not allow property owners to opt out.

Leaving gaps in a dune stabilization project reduces the benefits for adjacent properties somewhat, while leaving gaps in a beach nourishment project creates significant construction challenges and greatly diminishes the shore protection value of the project. Leaving a gap in a shore protection project is similar to leaving a hole in a dike.

The cost of annual debt payments would be on the order of \$30-50/lf of shoreline for dune project areas (\$3000 - \$5000 per 100' wide property) and around \$200/lf (\$20,000 per 100' wide property) for beach nourishment project areas.