THE STATE OF SOUTH CAROLINA
In the Court of Appeals

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SC Court of Appeals

APPEAL FROM HORRY COUNTY
Court of Common Pleas

Thomas A. Russo, Circuit Court Judge

Appellate Case No. 2018-002270
Case No. 2014-CP-26-07790

Richard Ciampanella, ...Respondent,

v.

City of Myrtle Beach, ...Appellant.

RECORD ON APPEAL
VOLUME 2

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ATTORNEYS FOR RESPONDENT

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[1] Respondent initially designated all trial exhibits in his designation of matter. However, in response to Appellant's motion to strike certain portions of his designation, Respondent agreed to strike Plaintiff's Exhibits 16, 20, 21, 22 and 23, and Defendant's Exhibits 1 and 2. (Resp't Return to Mot. to Strike, p. 7). Additionally, the Court granted Appellant's motion to strike the "Myrtle Beach Walkover Inspection Report." (Order Granting Mot. to Strike In Part, Aug. 30, 2019). Appellant continues to argue in its Reply Brief that this Court should not consider the following exhibits, which are irrelevant to this appeal: Court's Exhibits 1, 2, and 3, and Plaintiff's Exhibits 1, 15, 25, 27, 31, and 33. (Appellant's Reply Brief, p. 9-11).

[2] As indicated at the end of this Index, Plaintiff's Exhibit 2 (large photograph), Plaintiff's Exhibit 31 (CD of Steven Poletti, MD deposition), and Plaintiff's Exhibit 33 (screw) are being filed separately with the Court pursuant to Rule 210(f), SCACR.

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THE FOLLOWING EXHIBITS ARE ON FILE WITH THIS COURT:

Plaintiff's Exhibit 2 (large photograph);
Plaintiff's Exhibit 31 (CD of Steven Poletti, MD deposition);
Plaintiff's Exhibit 33 (screw); and
Court's Exhibit 2 (mock-up of railing).

[3] As indicated at the end of this Index, Court's Exhibit 2 (mock-up of railing) is being filed separately with the Court pursuant to Rule 210(f), SCACR.

PRID: 31674633 **Incident Number:** 1408723a **Unit Radio ID:** M62

Service: Myrtle Beach Fire Rescue
Base: Station 2
Unit: 14301
Shift: B
EMD: Not Available
Dispatched As: Fall Victim
Type of Svc: Scene Unscheduled
Response Code: Lights and Siren
Mode to Ref: Lights / Sirens
Moved Via: Backboard-Carry
Position: Supine
Outcome: Treated, Transported by MBFD (Amb Only)
Amb. Transport Code: Initial Trip

Date: August 19, 2014
Team: ALS
Crew 1: *Driver*
Brown, Andrew
EMT-P
Crew 2: *Primary Caregiver*
Boross, Kevin
EMT-B
Mode to Rec: No Lights/Sirens
Moved From: Stretcher
Pt. Condition: Unchanged

PLAINTIFF'S EXHIBIT 1 1:23-17 HD

Location: Grand Shores Ocean Resort
201 77th Ave N
Myrtle Beach, SC 29572
United States
Requester: 911

Receiving: *Hospital*
Grand Strand Regional Medical Center
Emergency Department
809 82nd Parkway
Myrtle Beach, SC 29572-4607
(843)692-1000
Rec. MD: Team Health
Rec. RN: Beau Stubs

Last Name: Campanella **First:** Richard
Address: 139 BrambleWood Dr
City: Myrtle Beach **ST:** SC **Zip:** 29577
County: Horry
Citizenship: United States
DOB: 11/29/1977 **SSN:** 242-33-5196
Age: 36y **Sex:** M **Weight:**
Height:
Subscriber: No **Resident:** No
Race: White, non-Hispanic
DNR Orders: None
Billing Information:
None Given

Odometer		Times	
Ld Miles:	1.6	Dispatch:	23:05
		EnRoute:	23:07
		At Ref:	23:10
		At Patient:	23:11
		Leave Ref:	23:28
		At Rec:	23:31
		Available:	23:55

Consent Signed: Yes
PCS / Medical Necessity Signed: No
Primary Method of Payment: Self Pay

Scene Information

Description: Pt was found lying supine on bed inside hotel room.

Chief Complaint (Category: Fall Victim)

Lower Back Pain

Duration: 2 Hours
Anatomic Location: Back

History of Present Illness

Pt stated he fell 2 hours prior to EMS arrival. Pt's back pain had increased to where pt had trouble walking around and functioning normally. Pt wanted taken to hospital for evaluation.

Medical History	Current Medications	Allergies
None Obtained From: Patient Emergency Info Form: No	None Listed	NKDA - Reported by patient.

Neurological Exam

Activity

Time	H.R.	B.P.	MAP	SaO2		Resp	Rhythm	GCS	ECG Method	Prtcl	RTS	CRW*	
	H.R. Method	Method	LOC			Resp Effort							

Action | Comment

Alert Normal

Immob. M-62 found pt lying supine on bed inside hotel room. Pt stated he fell 2 hours prior to EMS arrival. Pt's back pain had increased to where pt had trouble walking around and functioning normally. Pt wanted taken to hospital for evaluation. Pt was packaged, loaded into ambulance and taken to GSRMC. Patient immobilized with LBB, Collar. Assessment: Good pulse, motor, sensation. Complication: None. Authorization: Via Protocol. Pt. Response: Unchanged.

23:29 #2

Hosp. Notify Normal alert sent by Kevin Boross via Radio.

* *Assessment made by*

Response Factors Affecting Care: None
Scene Factors Affecting Care: None
Transportation Factors Affecting Care: None
Dispatch Factors: None
Turn-Around Factors: None

Brown, Andrew: _____

Boross, Kevin: *Electronically Signed on 08/22/2014 10:43:37 EST*

Neurological Exam

Level of Consciousness: Alert **Loss of Consciousness:** No
Chemically Paralyzed: No
Neurological Present: Normal
Mental Present: Normal

Glasgow Coma Scale	E	V	M	Tot
Int:	4	5	6	= 15

	Motor	Sensory
LA:	Normal	Normal
RA:	Normal	Normal
LL:	Normal	Normal
RL:	Normal	Normal

Airway / Respiratory

Status: Patent **Effort:** Normal

Cardiovascular

Pulses	Left	Right
Carotid:		
Radial:	Normal	
Femoral:		

Injury Details

Reason for Encounter: Injury/Trauma
Drugs/Alcohol?: None
Intentional: No
Fall Height: 2 FT
Fall Surface: Not Recorded
Landed On: Back
Work Related: No
Injury Cause: Fall
Mechanism: Fall

Initial Physical Findings

Assessment

Left Arm: Normal
Right Arm: Normal
Left Leg: Normal
Right Leg: Normal
Skin: Normal

Impression / Diagnosis

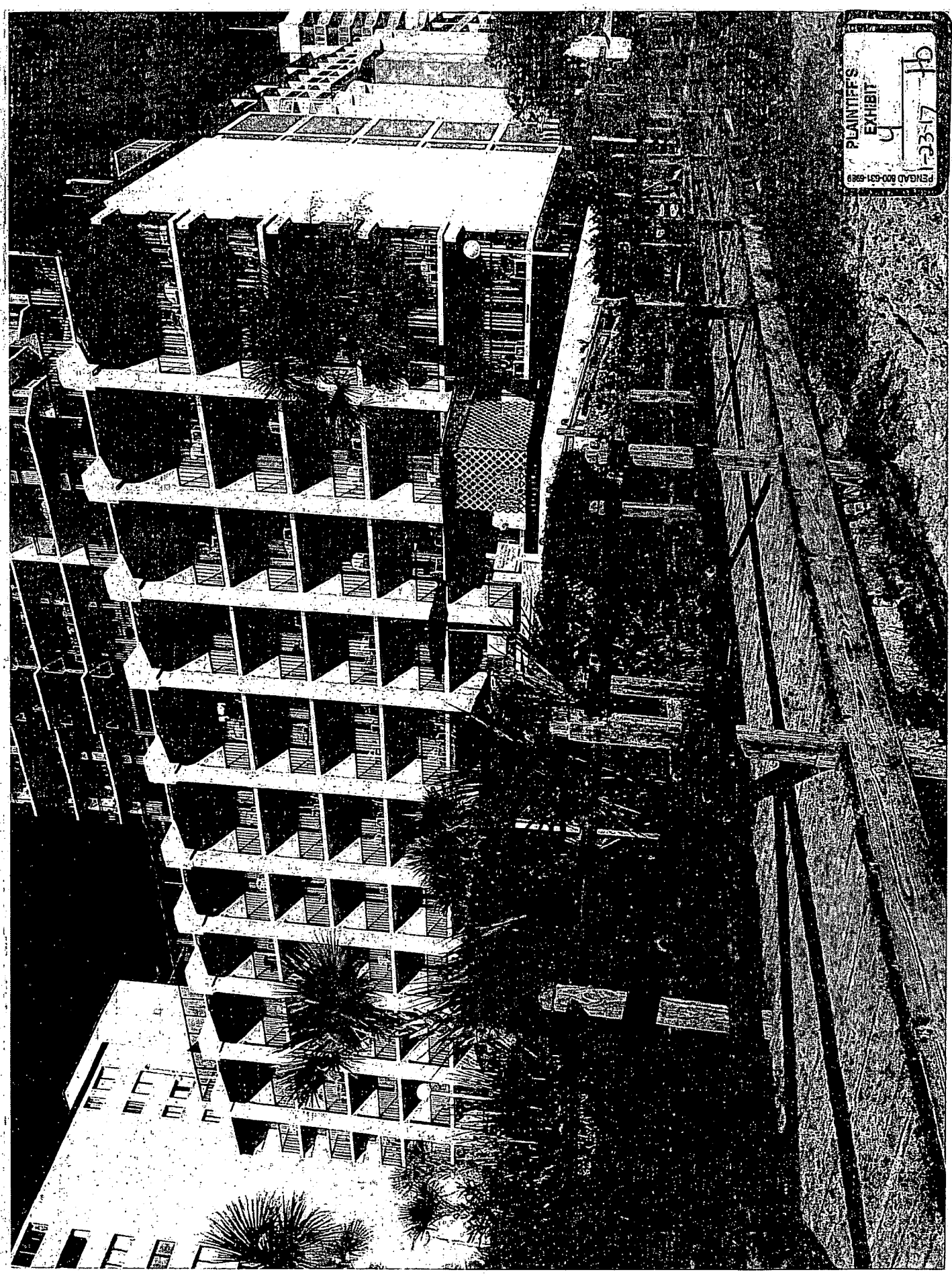
System: Musculoskeletal
Symptoms: Pain
Impression: Pain
Initial Patient Acuity: Lower Acuity (Green)

Activity

Time	H.R.	B.P.	MAP	SaO2		Resp	Rhythm	GCS	ECG Method	Prtcl	RTS	CRW*	
	H.R. Method	Method	LOC			Resp Effort							
Action	Comment												
23:28	93	172 / 107	129			18		4/5/6		General	12	#2	

PLAINTIFF'S EXHIBIT 3 1-25-17 HB

PENDAD 800-631-6989


PLAINTIFF'S
EXHIBIT
4
1-23-17
PENDAD 800-631-6989

PLAINTIFF'S
EXHIBIT
5
1-23-17 TD

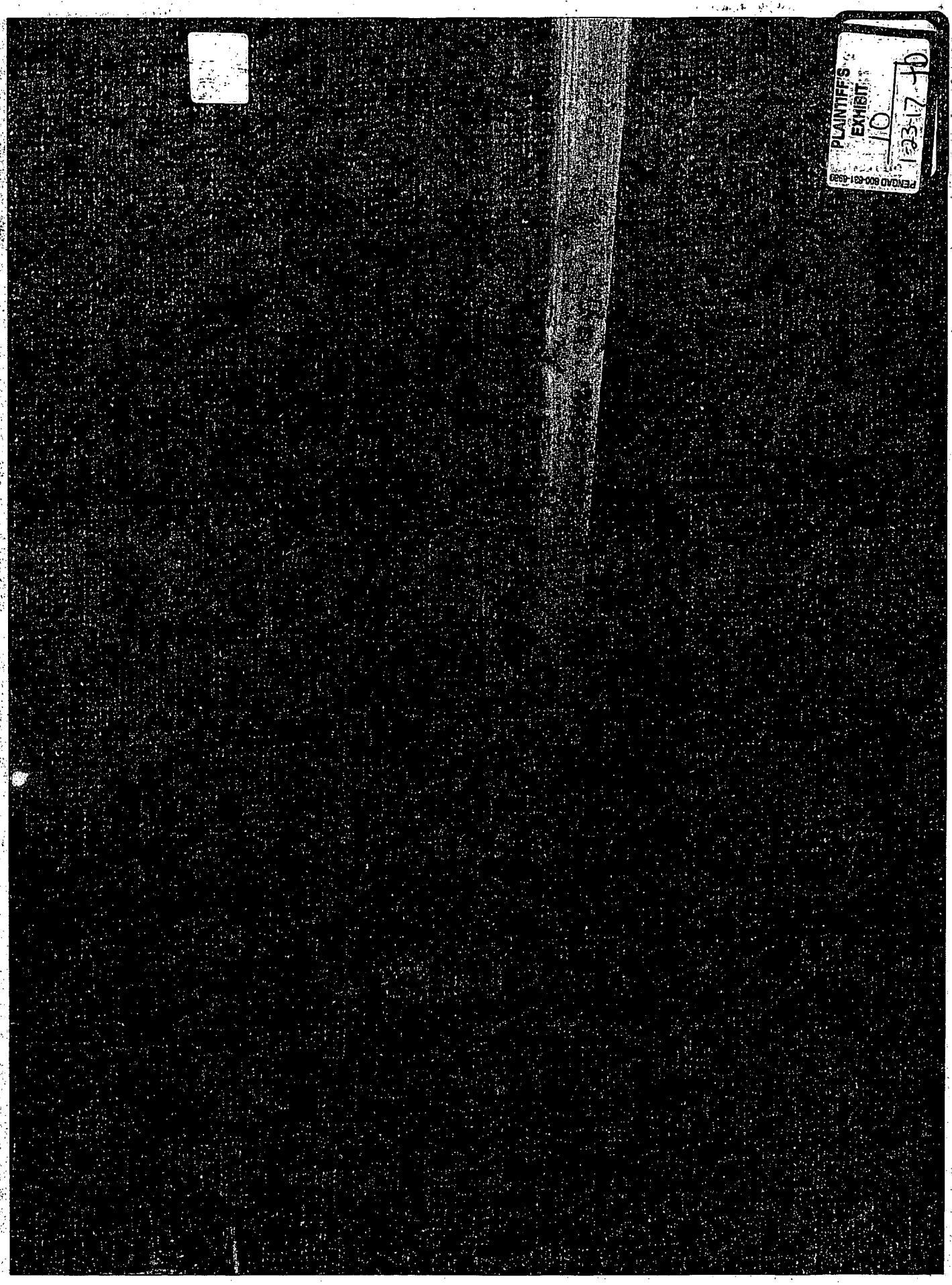
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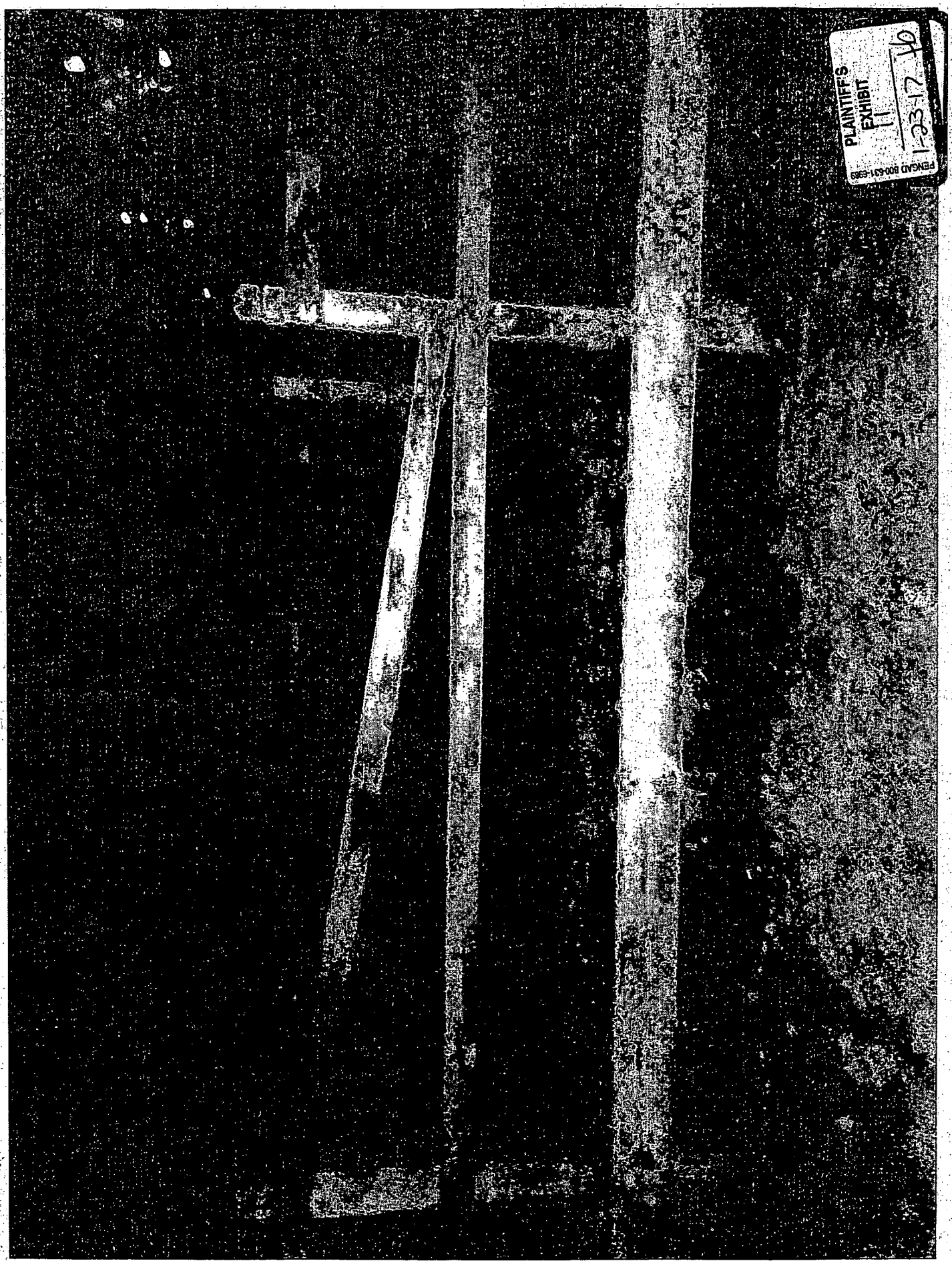
PLAINTIFF'S
EXHIBIT
6
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PLAINTIFF'S EXHIBIT
7
1-23-17 tb

PENGAD 800-631-6989
PLAINTIFF'S
EXHIBIT
8
1-31-17

PLAINTIFF'S
EXHIBIT
9
PENGAD 800-631-6989


PLAINTIFF'S
EXHIBIT
10
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PENDAD 800-631-6989


PLAINTIFF'S
EXHIBIT
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PLAINTIFF'S
EXHIBIT
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PENGAD 800-631-6989

TRASH
PLAINTIFF'S
EXHIBIT
14
1-23-17 tb

8432374659

238-5050

LOSS REPORT

NAME: Richard J Ciongoli Jr. HOME #(704) 929-6378

ADDRESS: 139 Bramblewood Dr. BUSINESS #( )
Statesville, NC 28625

DATE OF LOSS: 8-19-14 TIME OF LOSS: 8:15-8:20pm

WHERE DID THIS LOSS HAPPEN (Please provide a complete address):
Public Access on 77th Ave N. Myrtle Beach, SC beside
Grande Shores Ocean Resort

PLEASE GIVE A COMPLETE DESCRIPTON OF WHAT HAPPENED (Please be specific): was walking off beach around 8:20pm
was carrying a beach chair from enjoying sunset. I was walking
along the Public Access boardwalk when I stopped to talk
and leaned against railing. When I leaned against railing
I fell to ground as a result of the railing giving way.
I went to room after recovering my breath. Had EMS come due to pain around 11:30pm.

AMOUNT: _____ (please attach bills, at least 2 repair estimates and any other documents supporting this amount.)

IF THIS RELATES TO PROPERTY DAMAGE, ARE YOU THE LEGAL OWNER ___ YES ✓ NO

IF NO, PLEASE PROVIDE THE OWNER'S NAME, ADDRESS AND TELEPHONE #: _____

8-23-14
(DATE)

(SIGNATURE)

NOTE: THE ACCEPTANCE OF THIS FORM IS NOT AN ADMISSION OF LEGAL OR FINANCIAL LIABILITY ON THE PART OF THE CITY OF MYRTLE BEACH. THE CITY ACCEPTS THIS FORM AS AN ACCOUNT OF THE FACTS AS YOU UNDERSTAND THEM. HOWEVER, THIS FORM DOES NOT CONSTITUTE A "VERIFIED CLAIM", AS SET FORTH IN S.C. CODE 15-78-10 et seq AND IS NOT ACCEPTED AS SUCH BY THE RECEIVING ENTITY.

PLAINTIFF'S EXHIBIT 15 1-23-16 FB

PENGAD 800-631-6989

RESOLUTION R2012-74

CITY OF MYRTLE BEACH
COUNTY OF HORRY
STATE OF SOUTH CAROLINA

A RESOLUTION TO ADOPT THE 2012 BEACH MANAGEMENT PLAN FOR THE CITY OF MYRTLE BEACH.

WHEREAS, the beach is the dominant physical feature of the city, is the major factor in the city's economy, and defines the social fabric of the city; and

WHEREAS, the protection of the beach is of paramount community importance; and

WHEREAS, the City has long recognized the value and fragility of the beach and has commissioned studies, adopted regulations, and established a beach renourishment program; and

WHEREAS, the South Carolina Beachfront Management Act establishes a state policy to create a comprehensive, long range beach management plan and to require local comprehensive beach management plans for the protection, preservation, restoration, and enhancement of the beach/dune system.

NOW, THEREFORE, BE IT RESOLVED that the City Council:

1. Hereby reaffirm its commitment to preserve the beach as the City's most precious natural asset.
2. Hereby adopts the 2012 Beach Management Plan for the City of Myrtle Beach, and directs the City Manager to forward this document to the South Carolina Department of Health and Environment Control's Office of Coastal Resource Management for the inclusion in the State Beach Management Plan.
3. Thanks the staff that prepared this document and who continue to manage our beachfront.

SIGNED AND SEALED this 23rd day of October, 2012.

JOHN RHODES, MAYOR

ATTEST:

JOAN GROVE, CITY CLERK



2012 Beach Management Plan for the City of Myrtle Beach

1.0 Introduction

1.1. Purpose

Beach management is often thought of as the protection of a natural resource and nearby private investment. It is much more than that for Myrtle Beach. The beach is the dominant physical feature of the city, establishing its eastern boundary and affecting its climate. The beach is also the major factor in the city's economy, with tourism supporting hotels and motels, condominiums, campgrounds, amusements, golf courses, restaurants and retail shops. The beach defines the social fabric of the city, as some 27,109 permanent residents, many of whom live here because of the beach, share their home with approximately 15 million visitors each year. This beach management plan recognizes the vital nature of the beach for the city.

Beach management planning provides a way to protect the important functions of our sandy coastline. Those functions include providing habitat to hundreds of species of plants and animals dependent upon the beaches, dunes, and near-shore waters for all or part of their lives; recreational opportunities for visitors and residents; and a first line of defense during storms when the beach and dune systems act as a buffer between the storm waves and the coastal structures, absorbing storm-produced energy and thus reducing damage to those structures.

In accordance with the *State Beachfront Management Act*, the City of Myrtle Beach has prepared this comprehensive beach management plan in coordination with the SC Department of Health and Environmental Control's Office of Ocean and Coastal Resource Management (DHEC-OCRM). The City's plan represents considerable effort, inventory, and deliberation on the part of this local government, and establishes a strategy for the management of the beach for the sustainable enjoyment by residents and visitors. This beach management plan is intended for incorporation into the *State Beachfront Management Plan* in accordance with the provisions of the *State Beachfront Management Act*.

Once adopted locally, DHEC-OCRM reviews the plan for approval, and approved local plans become part of the *State Beachfront Management Plan*. Once approved, the local plan is required to be updated every five years in coordination with DHEC-OCRM.

Local beach management plans are required to include a minimum of ten elements:

1) an inventory of beach profile data and historic erosion rate data;
2) an inventory of public beach access along with a plan for enhancing public access and parking;
3) an inventory of all structures located in the area seaward of the setback line;
4) an inventory of turtle nesting and important habitats of the beach/dune system and a protection and restoration plan if necessary;
5) a conventional zoning and land use plan consistent with the purposes of the *Act* for the area seaward of the setback line;
6) an analysis of beach erosion control alternatives, including renourishment for the beach under the local government's jurisdiction;
7) a drainage plan for the area seaward of the setback zone;
8) a post disaster plan including plans for cleanup, maintaining essential services, protecting public health, emergency building ordinances, and the establishment of priorities, all of which must be consistent with the *Act*;
9) a detailed strategy for achieving the goals of this chapter by the end of the 40-year retreat period. Consideration must be given to relocating buildings, removal of erosion control structures, and relocation of utilities; and
10) a detailed strategy for achieving the goals of preservation of existing public access and the enhancement of public access to assure full enjoyment of the beach by all residents of this State.

As required by DHEC this plan has been developed with a varied user group in mind. The plan is comprehensive enough that any resident of the State who reads the plan can understand the general layout, conditions, issues, and management strategy of the community. The plan also adequately documents important management concerns, issues, and policies that may affect or be affected by Federal, State, or local funding limitations. The plan provides guidance to DHEC on local

policies, regulations and procedures related to beach management. The local plan has been detailed enough that State agents can use the document as part of the beachfront emergency response and damage assessment program.

The plan also identifies and discusses the economic and social benefits, issues and opportunities, and local, State, and Federal policies and authorities related to the management and protection of the city's beach. This beach management plan represents the foundation for a comprehensive, long-range, and enforceable local management strategy for the beachfront area of Myrtle Beach.

1.2. History

This beach management plan has been prepared for several reasons. One is to put into a single, written document the City's longstanding recognition of the value and fragility of the beach. There have been numerous studies of the beach over the past 40 years. As in the past 40 years the City continues to take action to protect and enhance the beach.

In 1981 public discussion began about a three-pronged beach management program. In 1985 that program became a reality with the City establishing a program to regulate development on the beachfront with a minimum required setback, to renourish the beach, and to maintain the renourished beach annually.

The City of Myrtle Beach implemented its first beach management plan in 1992 as required under the *State Beachfront Management Act*. The plan was accepted and approved by the SC Coastal Council (now known as DHEC - OCRM) on June 14, 1991. The *Beach Management Plan* was adopted as part of the *City of Myrtle Beach Comprehensive Plan* in 1999, 2006 and 2011. This document is a complete rewrite and update of the *1992 Beach Management Plan – City of Myrtle Beach, SC* and will be adopted by reference in the *City of Myrtle Beach Comprehensive Plan*.

The *State Beachfront Management Act* became law in 1988 with revisions in 1990 and is intended to protect both life and property, protect unique ecological habitats, and preserve the beach for future use by all citizens of SC. The *Act* addresses preservation of a dry-sand beach, public access opportunities, measures for renourishment on eroding beaches, and the protection of natural vegetation within the beach and dune system. The *Act* rejects the construction of new erosion control devices and adopts retreat and renourishment as the basic State policy for preserving and restoring the beachfront in SC. The *Act* also directs DHEC-OCRM to implement the 40-year retreat policy by designating a baseline and setback line on all beachfront properties, and develop a long range comprehensive state plan for management of the beach and dune resources.

Since OCRM is tasked with enforcing the *Beachfront Management Act* this provides DHEC with regulatory and permitting authority along the beachfront. The key lines of jurisdiction include the OCRM baseline and the setback line. The baseline for a standard erosion zone is established at the location of the crest of the primary oceanfront sand dune in that zone. The setback line is a boundary established by OCRM that is dependent upon the baseline position and the local long term erosion rate. The setback line is drawn landward of the established baseline at a distance equal to 40 times the average erosion rate. State law requires OCRM to review baselines and setback lines every eight to ten years to account for natural and man-made changes. Jurisdictional lines are based on the best scientific and historic data available.

1.3. Description of Myrtle Beach

Myrtle Beach is part of a larger area known as the Grand Strand. The Grand Strand is a 60-mile stretch of coastline from Little River on the SC - NC state line through Pawleys Island in Georgetown County. Myrtle Beach is less than 1,000 miles from 31 major cities in the US and Canada. Beautiful clean, white beaches and a wide variety of attractions, entertainment theaters, shopping centers, restaurants and golf courses draw visitors throughout the year. The average air temperature is 75°F and water temperature is 67°F.

Myrtle Beach, along with the cities of North Myrtle Beach and Conway, are the primary urban centers in a three-county area known as the Waccamaw region that includes Horry, Georgetown and Williamsburg counties. Myrtle Beach is the most populous city within Horry County, which is one of SC's fastest growing counties and the largest in land area. Myrtle Beach is located in Horry County in northeastern SC. The center of the city lies at the end of US Highway 501, the major east/west corridor connecting Myrtle Beach after the highway bridges the Atlantic Intracoastal Waterway.

Midway Swash forms the southern boundary of the city at the beach. The city's northern boundary is approximately 600 feet south of Singleton Swash. Between these two inlets, the beach is crossed by three other inlets, Withers, Deephead and Canepatch swashes.

Myrtle Beach has grown in size since its original incorporation in 1938 when it was designated as a town and in 1957 as a city. Myrtle Beach currently covers an area of 23.55 square miles as of 2010. The greatest period of annexation was from 1970-1979, when approximately 5,150 acres were added to the city limits. The majority of this acreage was part of the former Myrtle Beach Air Force Base now known as the Market Common district. Since 2000 approximately 3,300 acres have been added to the city limits.

The city extends for a length of 10 miles with an average width of one mile (three miles in width at its widest point). The width is determined by the Atlantic Ocean on the east and the Atlantic Intracoastal Waterway on the west (with the exception of the Grande Dunes development which extends across the waterway.)

Elevations rarely exceed 25 feet above mean sea level within the city. This flat topography, along with the city's long, narrow shape, makes the beach the dominant physical feature.

1.3.1. Population and Demographics

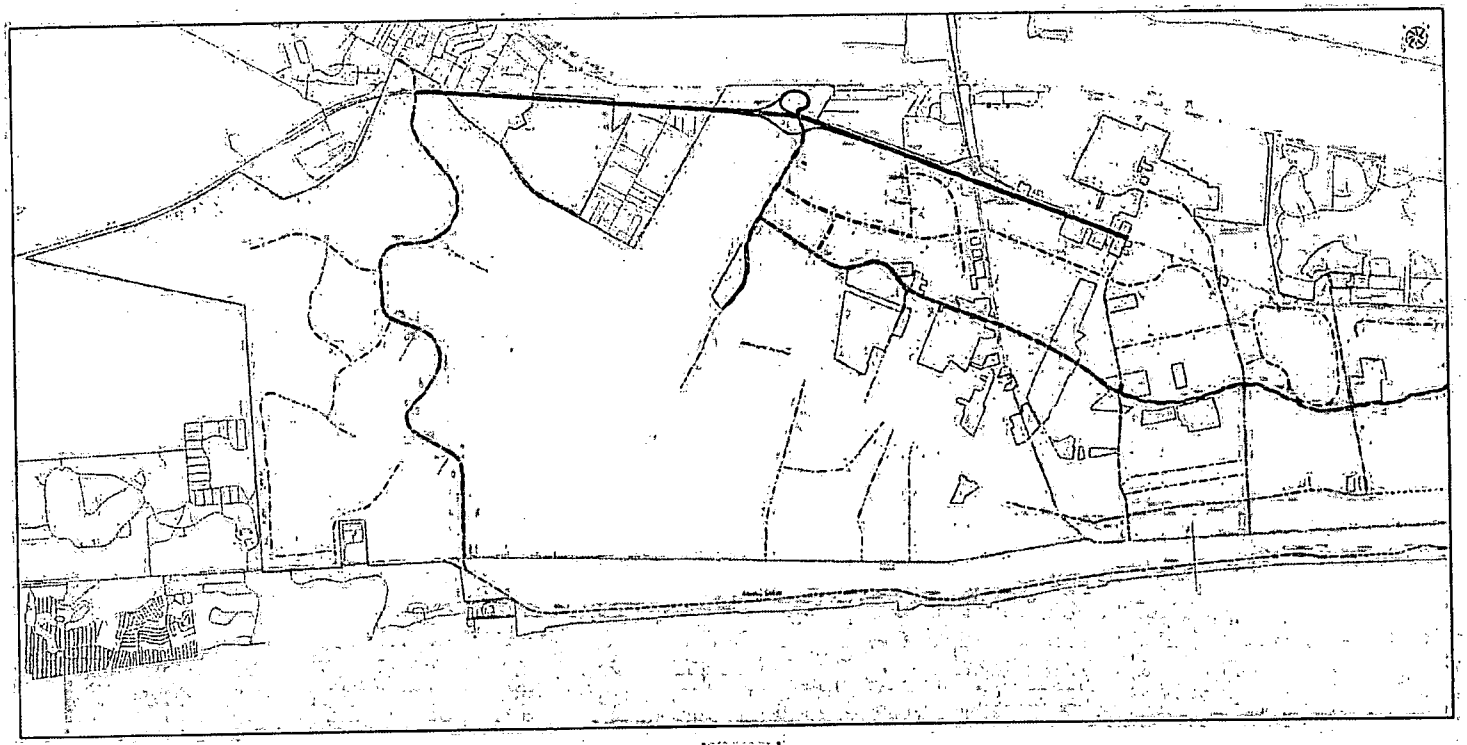
Due to its warm climate and coastal amenities, the Grand Strand region has become a relocation magnet for retirees. The US Census Bureau estimated the Myrtle Beach population to be 27,109 in 2010. According to the 2000 US Census data 17 percent of residents within the Myrtle Beach planning area are 65 and older. The group with the most residents is in the 25-44 age group, followed by those who are 45-64 years old. Together, these two age groups comprise over 56 percent of the area's population. The racial composition of Myrtle Beach is almost 85 percent white. Thirty-eight percent of residents in Myrtle Beach are native to SC and the US. Twenty-six percent of the population holds an associate degree or higher. According to the *American Community Survey 2005-2007* the median household income in Myrtle Beach was $35,141.

Myrtle Beach is known worldwide and the unsurpassed beauty of the beach and the mild climate continue to attract visitors to the area year-round. Considered one of the nation's most popular vacation destinations, the area hosts over 15 million day and overnight visitors annually. Visitors include the typical summer vacationer and snowbirds (visitors from colder climates such as Canada and the northernmost states) that stay for up to 6 months each year.

1.3.2 Physical Description Including Major Roads and Bridges

The major north-south corridors through the city are Hwy 17 bypass, Robert M. Grissom Pkwy and Kings Hwy (Hwy 17 business) and Ocean Blvd. The major east-west corridors through the city are Farrow Pkwy, Harrelson Blvd, Hwy 501, Mr. Joe White Ave, 21st Ave N, 29th Ave N, 38th Ave N, 48th Ave N, 62nd Ave N, 79th Ave N, 82nd Pkwy and Grande Dunes Blvd. The following maps show the road classification system utilized by the City of Myrtle Beach.

City of Myrtle Beach Roadway Classification Systems Map 2009



Legend

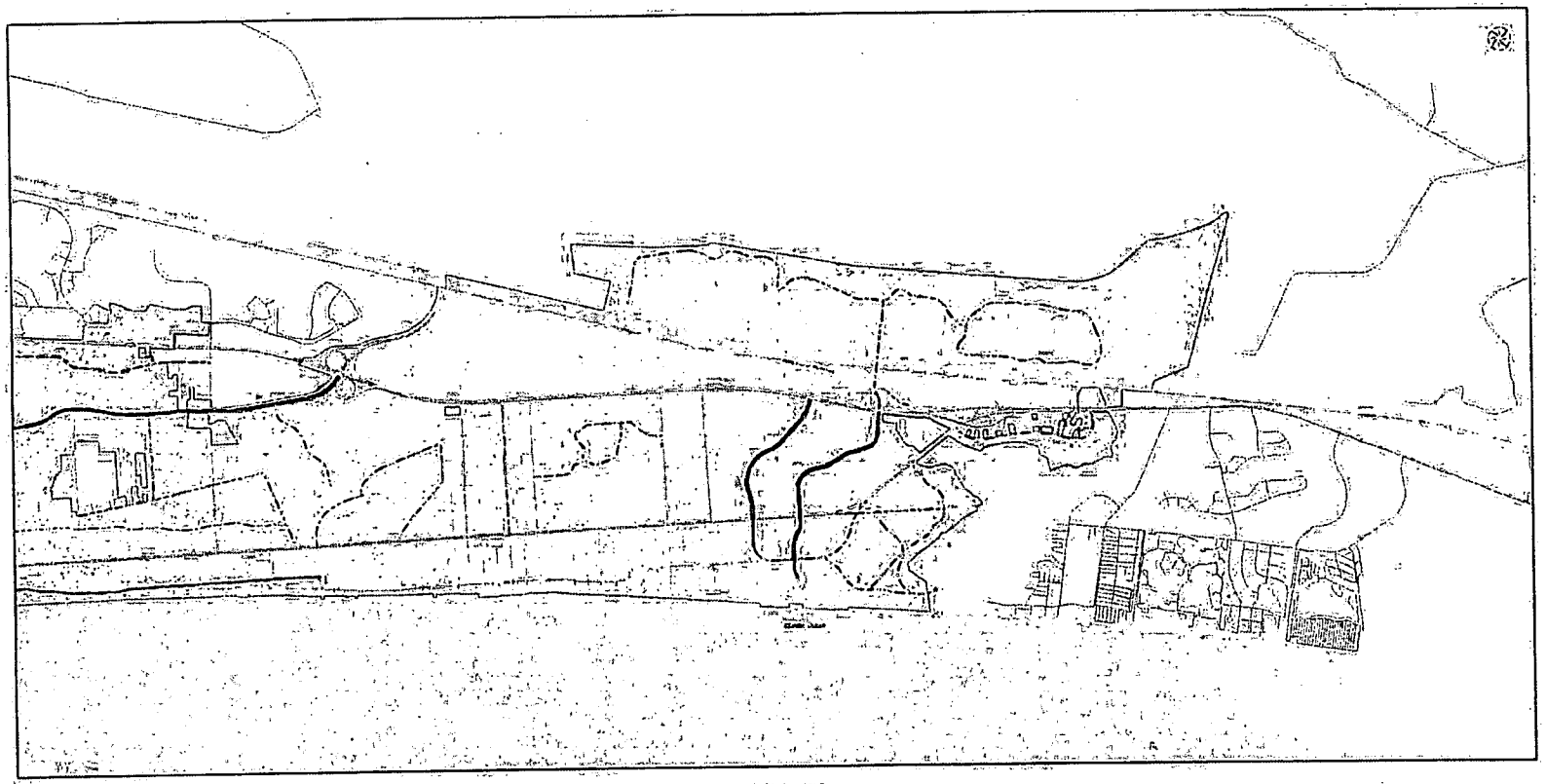
Roadway Classifications

<all other values>

Street Classification

- Minor Residential - (MIRES)
- Major Residential - (MJRES)
- Minor Commercial - (MICOM)
- Major Commercial - (MJCOM)
- Minor Collector - (MICOL)
- Major Collector - (MJCOL)
- Minor Arterial - (MIART)
- Major Arterial - (MJART)
- Street End - (SE)

City of Myrtle Beach Roadway Classification Systems Map 2009



Legend

Roadway Classifications

<all other values>

Street Classification

Minor Residential - (MIRES)

Major Residential - (MJRES)

Minor Commercial - (MICOM)

Major Commercial - (MJCOM)

Minor Collector - (MICOL)

Major Collector - (MJCOL)

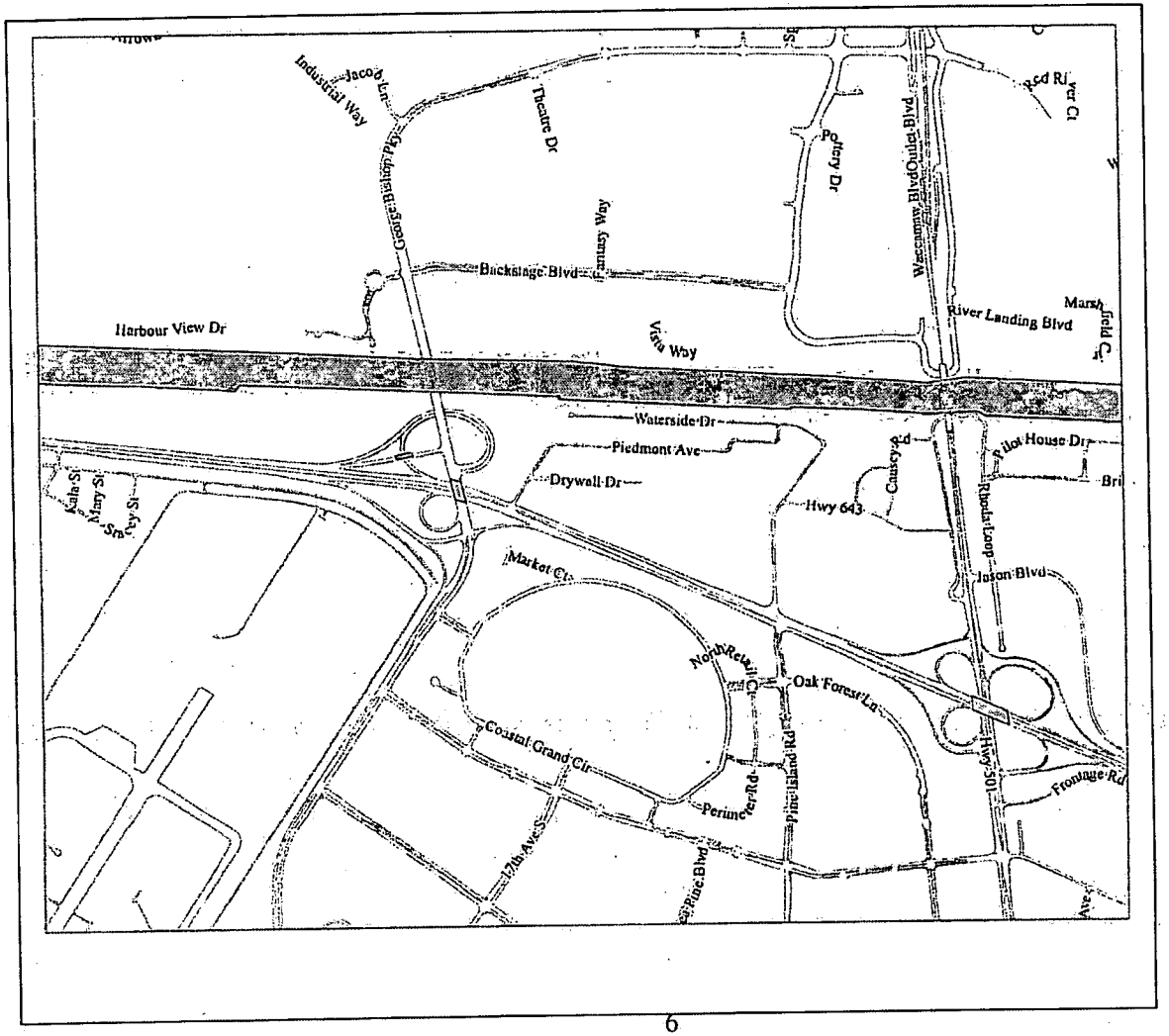
Minor Arterial - (MIART)

Major Arterial - (MJART)

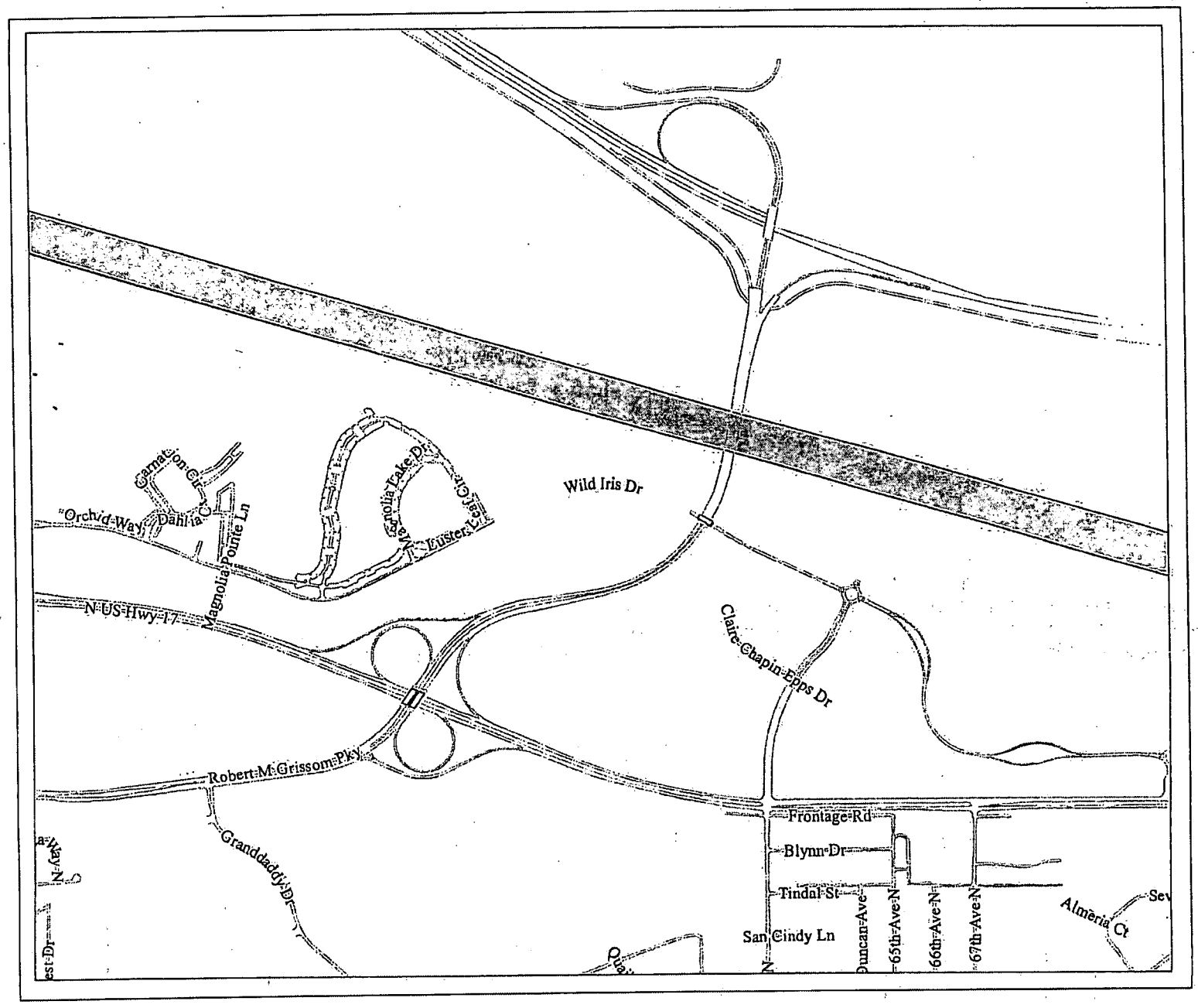
Street End - (SE)

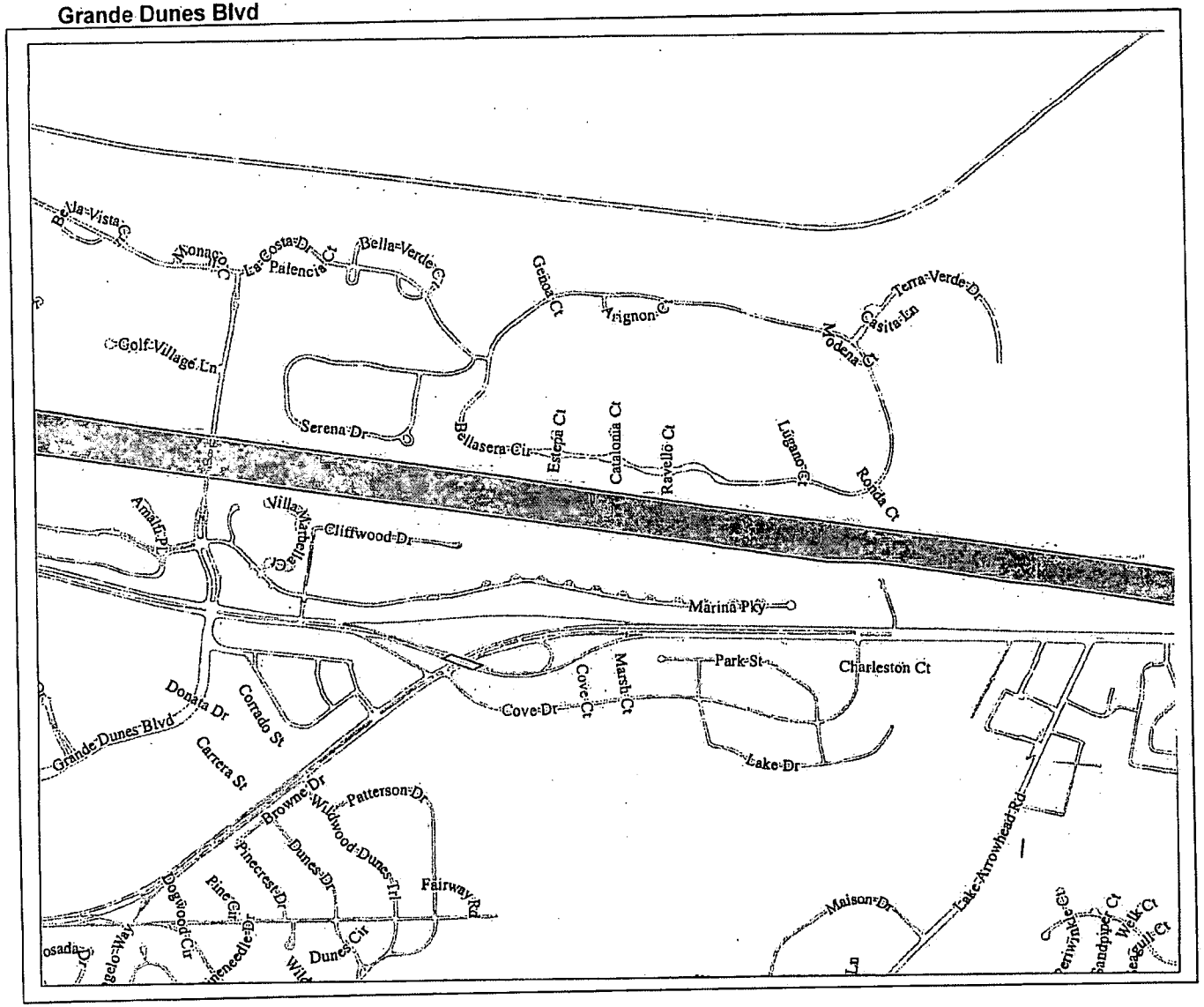
1.3.2.2 Major bridges provide access to and from Myrtle Beach over the Intracoastal Waterway including the Hwy 544 bridge (outside the city limits) on the south side of the city, Fantasy Harbour and Hwy 501 bridges in the center of the city and the Robert M. Grissom Pkwy interchange on the north end of the city. The bridge over the Intracoastal Waterway from Grand Dunes Blvd is privately owned but may be used as a connection to Hwy 31 in the event of an emergency evacuation.

Fantasy Harbour and Hwy 501



Robert M. Grissom Parkway Interchange




Grande Dunes Blvd
Via Vista Ct
Monaco Ct
La Costa Dr
La Palencia Ct
Bella Verde Ct
Golf Village Ln
Serena Dr
Gaeta Ct
Arignon Ct
Modena Ct
Casita Ln
Terra Verde Dr
Bellasera Cir
Estepa Ct
Catalonia Ct
Ravello Ct
Lugano Ct
Ronda Ct
Amalfi Pl
Villa Marina Ct
Cliffwood Dr
Marina Pky
Donata Dr
Corrado St
Grande Dunes Blvd
Carrera St
Cove Dr
Cove Ct
Marsh Ct
Park St
Charleston Ct
Lake Dr
Browne Dr
Wildwood Dunes Trl
Patterson Dr
Pinecrest Dr
Dunes Dr
Pine Cir
Dogwood Cir
Fairway Rd
Dunes Cir
Maison Dr
Lake Arrowhead Rd

1.4. Local Beach Management Issues

1.4.1. Economic

Beach density studies have been recommended by the Planning Commission to determine the actual capacity of the beach including how many people the beach actually will hold. At some overdeveloped beach communities beachgoers often find it difficult to find a spot to lay their towels/blankets because of the crowded conditions. Shadows on the oceanfront are being created by high-rise buildings.

Development and redevelopment issues are steadily being addressed. There have been suggestions by OCRM that the baseline line be moved seaward following renourishment. Historically through its action, City Council has supported the baseline and setback left in place as is or moved landward when appropriate.

Franchise agreements for providing water safety and beach rentals will continue to occur in Myrtle Beach.

With the current economic climate and emphasis on expanding business opportunities vending is now being allowed in the boardwalk section of the oceanfront.

1.4.2. Environmental

Water quality is an ongoing issue that is being addressed by the City and other agencies. Best management practices for stormwater management and alternatives to impervious surfaces should be developed and utilized including rain gardens, pervious concrete or other materials, bio swales, etc. which are less costly than offshore outfall and storm pipes on the beach. Green building standards are currently included in the *Zoning Ordinance.*

Hurricanes and storm damage are continual concerns. The need for adequate storm preparation and recovery is an on-going process.

OCRM takes beach renourishment into account when setting the baseline. The baseline should not be moved seaward because renourishment is a temporary fix. By encouraging people to build closer to the water allows for more storm damage. Additionally, the State Legislature continually addresses OCRM setback rules allowing more development closer to the water. The City has adopted ordinances which go beyond the State's beach setback rules. Over time these regulations should have the effect of moving development landward to prevent storm damage. The dune system and its vegetation must be protected as it serves as the first line of defense during storms. The dune system creates a natural habitat for wildlife and plant life.

Rip currents are always an issue. The City and local media have programs in place alerting swimmers to the dangers of rip currents and how to swim out of them. Lifeguards and ocean rescue continue to post warnings when rip currents are occurring.

Renourishment will continue to be an ongoing issue that must be addressed to protect the fragility of the oceanfront. Monitoring is an ongoing process with the need for continuous funding for renourishment efforts.

Litter control needs to include recycling containers on the beach adjacent to the trash receptacles. Pet waste needs to be disposed of properly.

Sea turtle nesting activity takes place from dusk to dawn. The City will continue to enforce existing light and glare and sea turtles regulations in the *Zoning Ordinance*, and will work with beachfront property owners to voluntarily reduce unregulated lighting which affects turtle nesting. Additional signage regarding sea turtle nesting habitat zones needs to be addressed.

1.4.3. Social

Public access needs will continue to grow as the region grows. Undeveloped land along the oceanfront is rare. A feasibility study for purchasing land for public access and larger regional parks needs to be undertaken. Parking in the residential areas continues to be an ongoing problem. The City should study the feasibility of establishing parking areas for daytrippers with the necessary amenities. Bicycle and golf cart parking convenience needs to be a high priority particularly in the residential areas.

Special events on the beach are currently regulated through special event permits. As business opportunities expand and the requests for special events grow special events will need to be carefully regulated and planned for appropriately by the City's Special Events Technical Review Committee without creating congestion and other problems for beachgoers.

Safety continues to be addressed by the City. Ocean rescue and beach patrols, in addition to the lifeguards, are constantly monitoring the beach and weather to keep beachgoers safe.

Public restrooms are currently located at Plyler Park, Withers Swash Park, Hurl Rock Park, 8th Ave N, 5th Ave N, 24th Ave N and 54th Ave N. Additional restroom and shower facilities may be needed.

Homeless populations have a negative impact on the water quality. Rudimentary privies set up along the tributaries which lead directly into our swashes and are incorporated into stormwater runoff contribute to a high fecal count causing swimming advisories in the area.

The *Natural Resources Council Report* has a negative impact on the area and needs to be addressed to prevent undue scares, economic fallout, etc. Programs are being implemented by the Public Information Division to bring the correct information about water quality and beach management issues to the public.

Beach regulations need to be uniform along the Grand Strand where appropriate. Many visitors do not know where each city/county limits begin and end. Since January 2011 the Coastal Alliance, an organization representing the municipalities and Horry County, has been looking at the need for uniform beach regulations. Recommendations including tents, pets, fires, fireworks, glass containers, destruction of sea oats/vegetation/sand fencing, watercraft, etc. were sent to the appropriate councils for consideration and approval in 2011. The Myrtle Beach City Council adopted new beach regulations on May 24, 2011.

1.5. Goals and Implementation Strategies

Goal - Life and property is protected from storms by understanding the importance of the beach and dune system.

- The City continues its policy of renourishment as the preferred type of erosion control.
- The City continues to allocate an appropriate amount of money each year for the beach maintenance and monitoring and will continue to project sufficient funds annually in the capital improvements program for beach renourishment.
- The Public Works Department continues to monitor the condition of the beach and to report its findings to the City Manager.
- The City continues to work with adjacent jurisdictions and the US Army Corps of Engineers in its proposed renourishment program to reduce storm damage.
- The City continues to enforce all provisions of the *Zoning Ordinance* and other land use regulations pertaining to the beachfront including the withholding of all permits for improvements seaward of the 40-year setback line until a permit for such land use has been granted by OCRM if such land use is subject to the permitting requirements of the *SC Coastal Management Act*.
- The City maintains its setback line based on erosion over a 50-year period.
- The City continues to regulate the construction of buildings, parking lots, and swimming pools seaward of the 50-year setback line.
- All construction in the City's Coastal Protection Overlay zone meets or exceeds minimum standards of "Design Standards for Permitting Process for Construction of Dune Walkovers Serving Oceanfront Properties."
- Decks, except pool decks as required by Federal or State regulations, will be made of wood, less than six inches above grade and no larger than 144 square feet. No deck will be constructed seaward of the baseline or otherwise alter or affect sand dunes, dune vegetation or the beach.
- The City continues to offer and participate in educational opportunities through the City's membership in the Coastal Waccamaw Stormwater Education Consortium, and in partnership with the Coastal Training Program.

Staff also participates in training provided by DHEC, NOAA and other agencies that are addressing beach management.

Goal - A shoreline retreat strategy is utilized.

- The City continues its policy of retreat based on erosion.
- The City Council amends the baseline and 50-year setback line established in the *Zoning Ordinance* at such time as OCRM amends its location of the baseline or its erosion rate for Myrtle Beach.
- The City continues to review *The Floodplain Management and Hazard Mitigation Plan* to consider additional steps the City may take, such as establishing a program of transfer of development rights to reduce susceptibility to coastal flooding, as well as to help realize the policy of retreat from the beach. The City considers alternatives which will have the effect of reducing the density of development between the beachfront and Ocean Blvd. The alternatives to be considered include rezoning to classifications which permit lower densities of development and a mechanism for the transfer of development rights from properties east of Ocean Blvd to land west of Ocean Blvd.
- The City requires that buildings, parking lots and swimming pools destroyed by natural and man-made causes be reconstructed as far landward as possible.
- The City, in accordance with the State's policy of retreat of structures threatened by erosion, prohibits temporary or permanent seawalls, bulkheads, revetments or other erosion control structures or devices.
- The City continues replacing destroyed utilities only if needed to serve nearby properties and, whenever possible, relocates the replacement utilities as far landward as possible.

Goal - The beach being the region's premier natural resource is managed so as to promote safety, water quality, and access within the context of the beach's critical role in the tourism economy.

- The City strives to maintain ocean water quality that meets or exceeds Federal standards.
- The City continues to enforce its stormwater management ordinance.
- The Public Works Department reviews the stormwater management ordinance against the water quality guidelines of the OCRM and proposes amendments, as necessary.
- The Public Works Department continues to manage the study of water quality in Withers Swash and, upon completion of the study, will recommend to the City Manager any appropriate and feasible measures for mitigation.
- The City, with DHEC and other local governments, continues to participate in an ocean water quality monitoring program with results being presented to the public to help ensure that adverse impacts are noted and acted upon.
- The City continues to review zoning, subdivision, and stormwater management regulations to ensure that performance standards are adequate to control nonpoint source pollution – natural and man-made pollutants that are transported by stormwater runoff and deposited into the watercourses.
- The City continues to seek grant funds to study alternative stormwater management systems along the beachfront, and to recommend to the City Manager, any appropriate and feasible alternatives.
- Subject to available funding, the City continues to include in the capital improvements program funds for the annual installation of stormwater management systems which will help eliminate existing pipe discharges onto the beach.
- The City will regulate encroachments of exclusive private land uses on City-owned beachfront property to minimize stormwater drainage problems at the dunes and active beach.

Goal - Disaster recovery and mitigation is part of local emergency operations protocol.

- The City annually updates its *Floodplain Management and Hazard Mitigation Plan* and *Emergency Operations Manual*.
- The City will continue to research and develop post disaster plans including plans for cleanup, maintaining essential services, protecting public health, emergency building ordinances, and the establishment of priorities, all of which must be consistent with the *State Beachfront Management Act*.

Goal - Protected habitat for native plants and animals is provided.

- The City continues to manage development so that it respects the vegetative communities and wildlife, including rare species in the area.
- The Cultural and Leisure Services and Police Departments will continue identifying loggerhead turtle nests and taking steps necessary to protect them. This program will include discovering nests when the beach is patrolled by City personnel, reporting the nests to DHEC's OCRM and Myrtle Beach State Park, and discussing protective measures with adjacent property owners.
- The City will intensify its program of protecting the sea turtles by establishing a public information program for residents, visitors, schools, and other interested groups and by encouraging voluntary practices of beachfront property owners that will increase protection of nests and hatchlings.

- The Public Works Department will work with Santee Cooper to shield street lights in areas of recorded sea turtle nesting activity. The City will also work with Santee Cooper in its public awareness campaign about nesting turtles and how lights affect them.
- The Construction Services Department will continue to enforce the existing light and glare and sea turtles regulations in the *Zoning Ordinance*, and will work with beachfront property owners to voluntarily reduce lighting which is not regulated but which affects turtle nesting.

Goal - A healthy leisure environment for State residents and visitors is provided.

- The City will continue to provide American Disabilities Act (ADA) compliant beach access for all residents and visitors with a goal of one per every half mile.
- The City will determine the feasibility of providing a regional beach access facility with a concession area, shower/restroom building, and additional parking for vehicles in the northern and southern portions of the beach.
- The City continues to regulate encroachments of exclusive private land uses on City-owned beachfront property and maintains public open space.
- The Public Works and Cultural and Leisure Services Departments continue to maintain all dune walkovers at publicly owned beach access points in their current or improved condition.
- Where walkovers are not located over dunes, the Public Works Department will review their placement and determine if any should be relocated. Any changes that are deemed appropriate will be made when the walkovers need major repairs.
- The Public Works Department maintains all emergency access points. Where possible, small dunes will be created to retain stormwater and reduce beach erosion down-slope of the emergency access points. The City will also continue to enforce the prohibition of unauthorized vehicles using emergency access points to gain access to the beach.
- The Department of Public Works continues to develop and maintain all beach access signs. The Department adds international symbols identifying parking permitted or prohibited, handicapped access, emergency access, surfing permitted or prohibited and keeping off the dunes.
- The Department of Cultural and Leisure Services maintains and services trash and recycled material receptacles on the beachfront. The Department of Public Works maintains and services all containers landward of the dunes.
- The City contracts to provide water safety along the nonresidential portions of the beach.
- The City continues to provide the Beach Patrol and ocean rescue team.
- The City continues to provide parking at street ends and along streets for use by the public.
- The Department of Construction Services will continue efforts to ensure that public parking spaces are not marked as private spaces for the patrons of adjacent businesses.
- The Department of Public Works will continue to provide bicycle and golf-cart parking at street-ends in residential areas are adjacent or near the beach.

1.6 Local Beach Management Policies

The City of Myrtle Beach has formal and informal policies and standard operating procedures in place regarding beach management.

Formal Policy Enacted by City Council

Appendix D contains Chapter 5, Sections 5-1 through 5-30 of the *Myrtle Beach Code of Ordinances* addressing beach and boating regulations. These regulations address public access, role of the Beach Advisory Committee, authority of the Beach Patrol, life guards, recreational fishing, floatation devices, bicycles, watercraft operation and storage, surfing, animals, alcoholic beverages, fires, glass containers, sleeping on the beach, destruction of sea oats, nudity, personal use of beach structures and abandonment, unauthorized vehicle use on beach, fireworks, swimming/diving/jumping, solicitation and commercial activities, changing clothes, glass containers, and litter.

Zoning Ordinance, Article IX, Section 916.12 addresses light and glare and sea turtles to prevent and minimize hazards to nesting female sea turtles and their hatchlings on the beach and property near the beach between 31st Ave N and 52nd Ave N, between Highland Ave and Canepatch Swash and between 77th Ave N and the northern boundary of the city.

Article XII, Section 1244 of the *Zoning Ordinance* includes supplementary regulations for oceanfront property. The purpose of the CP coastal protection zone is to provide supplementary regulations for oceanfront property seaward of the projected 50 year erosion control line to control erosion, preserve and maintain a recreational beach, safeguard property and promote public safety, while acknowledging the public benefit and historic location of pier structures on deeded pier

lots located approximately at 14th Ave N, 2nd Ave N and 54th Ave N. It is the intent to promote the retreat of buildings, structures and other improvements located on non-pier lots from the CP district or as far landward in the district as possible. Except for the piers on pier lots, if retreat is not possible, it is intended that existing buildings may be replaced without exceeding the gross square footage of the existing building and without any portion of the footprint of the building located in the CP district being exceeded. All property lying seaward of the building control line and extending eastward to the corporate limit of the City of Myrtle Beach are designated as the coastal protection district (overlay zone). A building control line is established at the projected 50-year shoreline (50-year future dune crest). The building control line will be located 34 feet landward and parallel to the baseline defined by the most recent baseline coordinates as provided by OCRM.

Informal Polices and Standard Operating Procedures

The City provides a beach patrol and ocean rescue team. Officers assigned to the beachfront utilize trucks, ATVs, jet skis and inflatable jet boats. The City provides water safety services through franchise agreements with beach service companies. The forecast from the National Weather Service (NWS) and actual conditions are reviewed each day by the Beach Patrol Division and swimming advisories are formulated. Rip current advisories are ranked as 1) low risk – no swimming advisory, 2) moderate risk – based on the actual conditions swimming can be limited to waist deep/knee deep or no swimming depending on actual real time conditions, and 3) high risk – based on the actual conditions issue red flag for no swimming or restrict swimming to waist deep/knee deep. The Police Department's Beach Patrol Division coordinates its work with the franchisees and with Horry County Police Department.

Beach Service franchisees are responsible for the maintenance, distribution and storage of beach wheelchairs between April 15 and September 30. Beach wheelchairs are available for one-hour time slots unless there is no one waiting to use a beach wheelchair. The Beach Patrol operates and maintains a program of distribution for individuals who wish to use the beach wheelchairs between October 1 and April 14. Depending on demand during the off-season beach wheelchairs can be used for the length of stay of the visitor and the hotel is responsible for storage during the visitor's stay.

Special Event/ Facility Use permits are considered on a case by case basis for activities such as weddings, and sporting events.

The Beach Patrol and Park Divisions patrolling the beach throughout the year address turtle management and large aquatic animals. When a turtle nest is located it is marked and secured until a representative from Myrtle Beach State Park can relocate the eggs to a safer location. The Department of Natural Resources (DNR) is contacted when a deceased turtle is found or a mammal washes ashore. DNR personnel collect data on the animal and in some cases the animal is transported to Charleston for a necropsy (autopsy). Once the data is gathered, if the animal cannot be removed by hand, the Parks Division staff responds with heavy equipment and the animal is buried off the beach. When large animals wash ashore, DNR contacts NOAA with a report as to the type of animal found such as dolphin or whale. NOAA then responds to the scene for scientific research, necropsy, or removal to their lab in Charleston.

Stormwater management is addressed by the Department of Public Works. The Department routinely checks the beach after all rainstorms to see if any repairs need to be done. During the tourist season Public Works checks the beach every Friday to dress up around pipes and decks. All swashes and outfalls are checked regularly by Public Works to be sure they are in line and not meandering down the beach.

The Departments of Public Works and Cultural and Leisure Services work to keep sand fencing in place to ensure protection of the dunes. Public Works maintains the signage at beach access points that explain the beach regulations including staying off the dunes and not picking sea oats.

The Department of Public Works is responsible for beach monitoring and coordinates with the US Army Corp of Engineers on the annual inspection of the beach and addresses any concerns. Public Works contracts and monitors the annual beach surveys.

Beach Maintenance is handled by the Department of Cultural and Leisure Services' Parks Division. The Division rakes the beach daily from May until Mid-October. During the Spring and Fall the beach is raked three to five times per week and during the winter months on Monday and Friday. Additional cleanups are done when debris such as seaweed and jellyfish wash up on the beach. Litter crews are on the beach daily picking up towels, chairs, tents, etc. that have been left behind or overnight, and emptying trash and recycling receptacles. The Parks Division is responsible for the repair and maintenance of the public beachside parking lots, beach access, sand fencing, posts, and signs. The Division is also responsible for the landscaping of the beachfront area including planting dune grasses. The Public Works Department is

responsible for the concrete, paved and gravel parking areas along the oceanfront as well as the showers at the beach access points.

2.0 Inventory of Existing Conditions

Details of existing conditions in the Myrtle Beach community are provided below in the following sections:

2.1. General Characteristics of Myrtle Beach

The entire length of beach within the incorporated area of Myrtle Beach has a vibrant vegetated dune system. After the renourishment effort in 1997, sand fencing with sea turtle access was installed on the beach with sea oats and American beach grass planted along the fencing. Over time a dune system has developed in all the fenced areas. The dune is vegetated and the City maintains this dune system by protecting access and fertilization of the grasses on an annual basis. When the sand fencing was installed from 29th Ave S to 31st Ave N, the fencing was placed seaward of the prior existing dune to facilitate an access road between the prior and new dune system. This road is utilized by emergency and service vehicles which prevent these vehicles from having to be on the recreational beach during high tourist season. The beach profile north of 31st Ave N was not sufficiently wide enough to allow this access road beyond this point.

During the annual profile development by Coastal Science and Engineering in the spring of 2009, representative samples of beach sand were collected at 8 stations along the profile line from the dry beach area to the low tide terrace. From a sieve analysis, the typical mean grain size was measured at 0.432 mm.

2.1.1. General Land Use Patterns

The land-use pattern in the city has been determined by a combination of the natural features and an automobile-dominated transportation. The ocean has been the major natural feature, attracting development in a long line paralleling the shore. Secondly, poorly draining soils have kept development from occurring in areas where they are present, until recently when property values have made remedial efforts worthwhile. Since World War II development has followed major highways and the automobiles that travel along them.

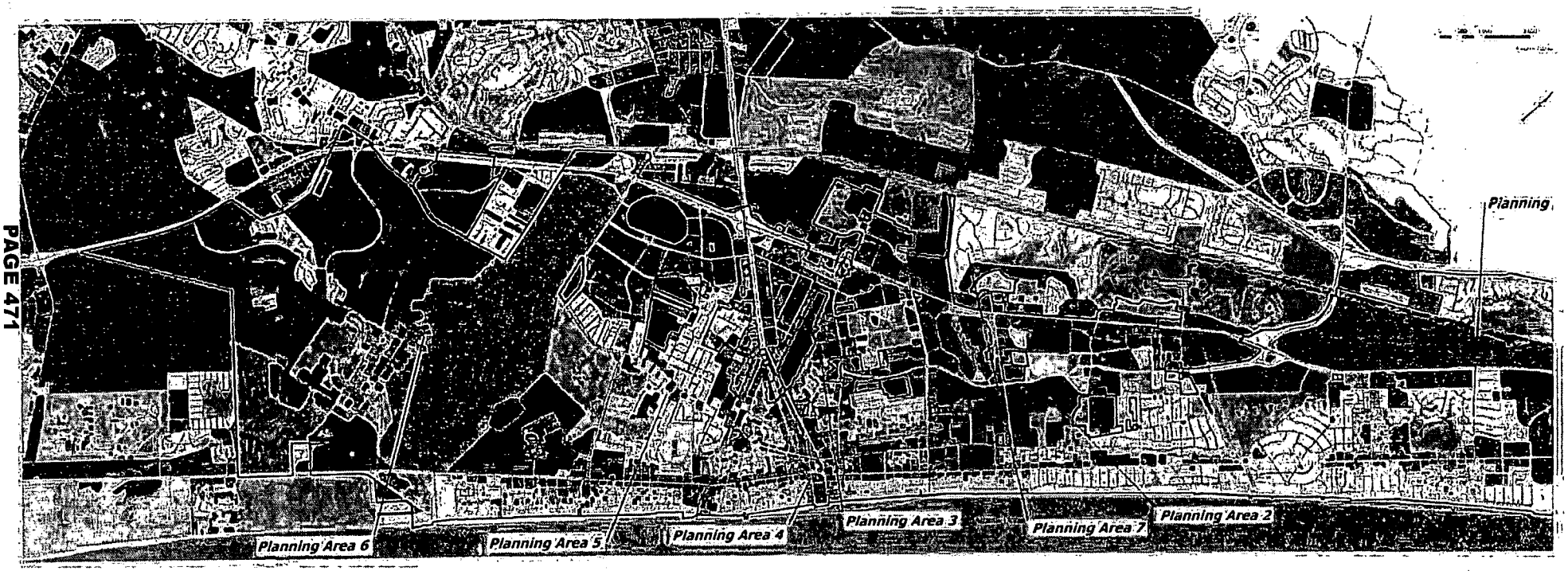
The pattern of land uses in Myrtle Beach is generally what would be expected for a coastal city whose formative years occurred in the last half of the 20th century and whose mold were cast in the post-World War II years. Hotels were built along the beachfront and Kings Hwy was for years the only regional north/south route. Commercial uses grew along the major thoroughfares; and housing was developed on good soils nearby. Expansion of the road system has primarily resulted in increased locations for new commercial development. Along the beachfront, properties are being redeveloped at greater intensities, as property owners there try to accommodate the growing tourist market or compete with new, larger businesses that have located in newly developing areas to the west.

More specifically, hotels and condominiums make up the landward area of the beach from 30th Ave S to 8th Ave N. From 8th Ave N to Mr. Joe White Ave, the land use is primarily commercial tourism related businesses. Northward from Mr. Joe White Ave to 31st Ave N, hotels and condominiums dominate the landscape. From 31st Ave N to 52nd Ave N, the land use is totally single family housing although some homes are tourism rentals. The section of beach from 52nd Ave N to 62nd Ave N is dominated once again by hotels and condominiums. North of 62nd Ave N to 68th Ave N, single family homes are featured. From 68th Ave N to 77th Ave N, hotels and condominiums again dominate the landscape and from 77th Ave N to 82nd Ave N, residential zoning prevails. Condominiums and hotels are prevalent for the next two blocks and residential dominates the northern end of the city limits. Each area presents differing challenges to City maintenance. In the hotel and condominium districts, maintenance crews deal with substantial numbers of beachgoers. In the residential areas, service issues are easier with less people on the beach.

There is a zoning district on the oceanfront between Hampton and Haskell Circles referred to as the cabana section. The purpose of the cabana section in the *Zoning Ordinance* is to allow the development of private cabanas, incidental to customary swimming and sunbathing activities, and to protect the unique scenic qualities of the cabana section. A cabana is an enclosed shelter or open deck or combination thereof not to exceed 200 square feet (covered or uncovered) area nor a height not more than 12 feet, measured above existing grade or to the base flood elevation, whichever is greater.

The City updated its existing land use map during the *Comprehensive Plan* rewrite process in 2011 which is shown on the following page

2.1.1 City of Myrtle Beach
Existing Land Use Map - 2011



Within the corporate limits of the City of Myrtle Beach, the map provides a breakdown of land uses for approximately 14,950 acres, including approximately 2,000 acres of roads, lakes and ponds. The largest land use category, undeveloped lands, is approximately 4,217 acres which is 33 percent of the total. Large undeveloped tracts include portions of Grande Dunes, Horry County owned lands adjacent to the Myrtle Beach International Airport, Withers Preserve and numerous large inner city tracts owned by Myrtle Beach Farms Company along the Robert M. Grissom Parkway corridor.

The second most common land use category is low density residential accounting for 2,374 acres (18 percent of developable land in the city). These areas of single family homes include the neighborhoods of Grande Dunes, Dunes Club, Pine Lakes, Northwoods, Ramsey Acres, Booker T. Washington and the numerous neighborhoods north of 31st Ave N and east of Kings Highway.

The third most common land use category is parks and recreation. Accounting for 1,433 acres (11 percent of developable land in the city) these areas of recreational lands include the golf courses of the Grande Dunes, Pine Lakes, Whispering Pines, Cane Patch, and Midway. It also includes all city parks such as Grand Park and the Frank Beckham Recreation Complex. Adjacent lands not included since they are unincorporated are the Myrtle Beach State Park and the Dunes Club and Myrtlewood golf courses.

The fourth most common land use category is the transportation/utilities. Accounting for approximately 1,300 acres, the primary use in this category is the land associated with the Myrtle Beach International Airport. The more than 2,000 acres of Myrtle Beach dedicated to ground based transportation and our street network, is not included in this category nor is this network considered in the total calculation of developable lands.

The fifth most common land use is general commercial with over 930 acres. While the majority of this type of land use occurs along the Kings Highway and US Highway 501 corridors, large general commercial use clusters also exist in Seaboard Commons and the Coastal Grand Mall area.

The sixth most common land use is the medium density residential. It includes permanent residential development ranging from eight to 20 units per acre and representing over 850 acres and seven percent of the developable land of the city.

While the medium density residential uses are scattered throughout the numerous residential areas of Myrtle Beach, the largest single concentration is the Seagate Village area of the Market Common district.

Four land use categories, amusement/entertainment, office professional, institutional/civic and commercial/industrial each account for about two percent of the developable land, ranging from 214 – 285 acres each. The most significant amusement/entertainment uses are associated with the Broadway at the Beach and Myrtle Beach Convention Center complexes.

The office professional uses are concentrated primarily along Oak Street, the office developments between 38th and 48th Aves N and offices near the Grand Strand Regional Medical Center. The largest institutional and civic use concentrations are associated with the Grand Strand campus of Horry-Georgetown Technical College and the complex of the Myrtle Beach area public schools between 29th and 38th Aves N.

The multi-use category occupies only approximately 60 acres (about 0.4 percent of developable land). This land use category is represented by the urban village at The Market Common and St. James Square at Robert M. Grissom Parkway and 38th Ave N.

The seventh most commonly occurring land use is the one most associated with our tourism community – the transient accommodations districts along the beachfront. This category accounts for approximately 525 acres or four percent of the developable land in the city. These uses can be found in the hotel districts on or adjacent to Ocean Blvd from 29th Ave S to the Grande Dunes and also more remote sites such as the time share along Robert M. Grissom Parkway between 29th and 39th Aves N.

In keeping with the *Comprehensive Plan's* theme of sustainability, all future land use planning will be based on best available sustainable practices. Land uses will also balance the socio-economic needs of residents, business owners, and visitors and will create an environment where all can live, work, and play with pride and pleasure. The *Comprehensive Plan* recognizes that we live in an active tourism community.

2.2 The Oceanfront of Myrtle Beach

2.2.1 Beach Uses

The primary uses of the beach include the traditional uses of walking, running, wading, swimming, surfing, shelling, fishing, kite flying, and sunbathing. Other popular activities include beach games and various types of regulated watercraft activities within designated zones.

- Walking, shell collecting and running are enjoyed by many along the beach.
- Swimming is allowed and the Beach Patrol Officers have the authority to call in a person from the ocean that is more than 50 yards from where the ocean adjoins the strand, who is shoulder deep at any time, who is within 150 feet of a fishing pier, in danger of drowning or may be imperiling the safety of others.
- Sunbathing is allowed on the beach. Nudity and indecent exposure as defined by City Code sections 14.81 and 14.83 is not allowed.
- Tents and other shading devices (but not beach umbrellas) must be at a distance of at least ten feet to the rear or to the side (inland side) of the existing umbrella line and lifeguard stands and in line generally parallel with the strand. It is unlawful to interfere with the ground level vision of the lifeguard stand.
- Games including volleyball nets are allowed on the beach as long as they do not cause an obstruction for the lifeguards and Beach Patrol.
- Boating is not allowed within 400 yards of the point where the ocean adjoins the strand or elsewhere along the beach that would create a hazard to bathers. No one is allowed to operate a motorboat, jet ski, skis, surfboard or similar device in a reckless manner or while intoxicated or under the influence of any narcotics, barbiturates and marijuana. Launching jet skis and motor boats from the beach or returning them to the beach from May 1 through Labor Day at any point along the beachfront in the areas of TA-80 (Transient Accommodations) zone south of 29th Ave S to 31st Ave N and from 69th Ave N to 7th Ave N is not allowed. This does not apply to licensed operators of banana boats and parasailing rides who conduct water sport activities south of 29th Ave S at Withers Swash at 3rd Ave S, between 8th and 9th Aves N. Operators, in consultation with the Beach Patrol, will mark off a safe zone channel in the surf zone, 50-100 feet wide for jet skis to enter and exit the water.
- Surf fishing is authorized and regulated by the Beach Patrol Officers.
- Special events are reviewed and approved on a case by case basis.

Aerial maps are available on a CD that illustrate beaches and beachfront jurisdiction including areas within the DHEC-OCRM definition of ocean beachfront in accordance with the Act. Contact the City of Myrtle Beach Planning Department at 843/918-1050 for a copy.

2.2.2 Benefits and Value of the Beach

Myrtle Beach, a part of the Grand Strand, has been a long standing vacation destination since the late 19th century. Today it is considered one of the top vacation destinations. Myrtle Beach has been rated by the Travel Channel as one of the "Top Ten Vacation Spots", Travel Ticker as one of the "Top Five Travel Destinations in 2011", US News and World Report as "Best Vacations", and 2011 Trip Advisor named Myrtle Beach as "the #1 Best Beach in the US".

The area hosts an estimated 15 million visitors annually. Visitors spend an average of $115 per person per day with average length of stay of 5 days, and group business travelers spend an average of $194 per person per day with an average length of stay of 3 days. Eighty-six percent of the visitors typically use their own car as their primary transportation. The Myrtle Beach International Airport reported 869,032 airport arrivals in 2010. Myrtle Beach and the Grand Strand attract a wide range of travelers with approximately 94 percent under the age of 65. Myrtle Beach and the Grand Strand attract middle-to-high income travelers. Visitor income has steadily increased over the years with 40 percent making over $100,000 annually (*Myrtle Beach Area Chamber of Commerce Statistical Abstract January 2012*).

Along the Grand Strand, 30 percent of our visitors come from NC. Another 22 percent travel from NY, PA, OH and VA. The following are the 2008 top 10 states of visitor inquiry origin: NC, SC, VA, OH, PA, GA, NY, TN, WV, and MD.

The SC Department of Parks, Recreation, and Tourism reports that Horry County collected $8.82 million in admissions tax and $13.67 million in accommodations tax in 2009. The SC Department of Revenue reports $7.65 billion in retail sales in Horry County in 2009. On average, every $84,225.00 spent by domestic travelers in SC during 2007 generated one job. Domestic travel expenditures in SC directly generated 115,200 jobs in 2007, an increase of three percent since 2006.

These jobs generated by domestic travel spending in SC composed almost six percent of the total state non-agricultural employment in 2007.

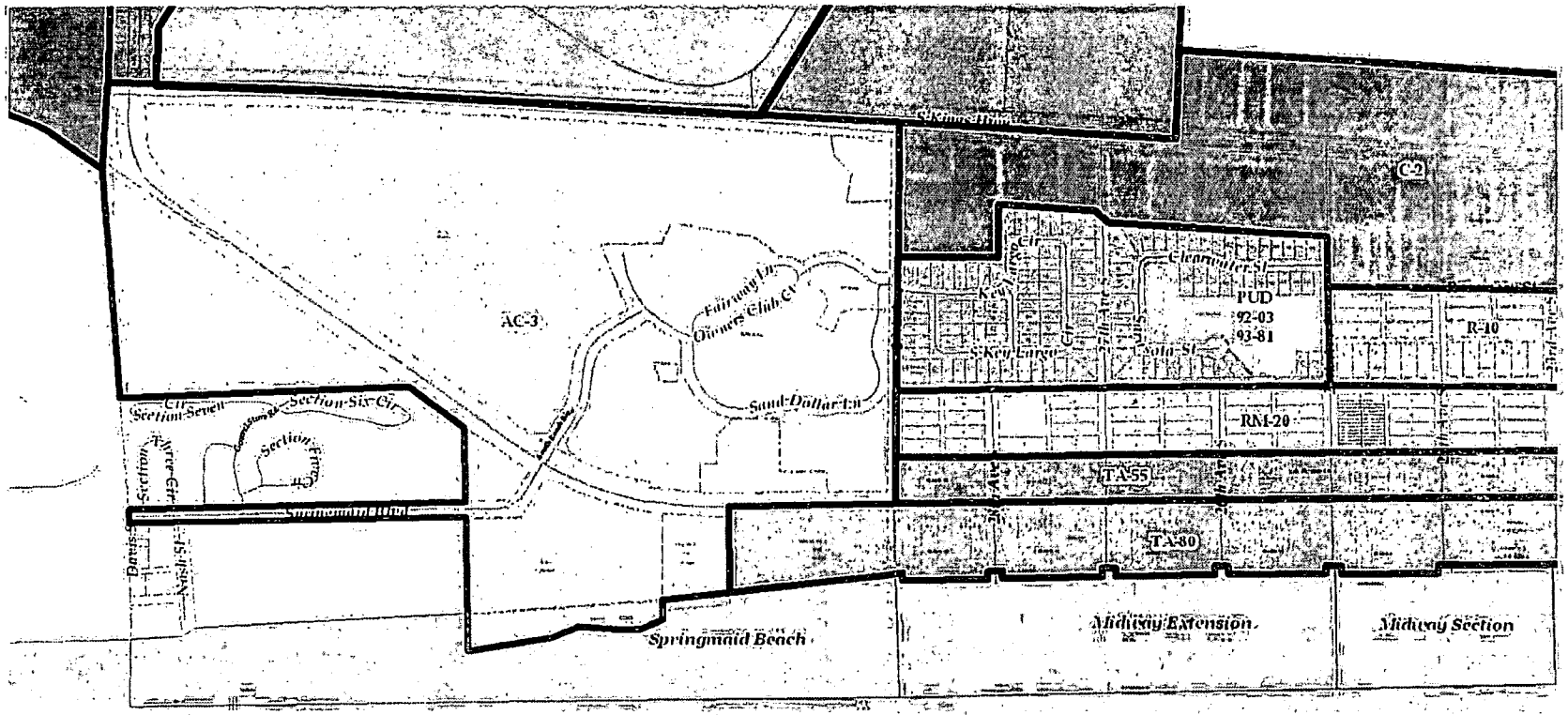
Domestic travel spending in South Carolina directly generated nearly $1.5 billion in tax revenue for Federal, State and local governments in 2008, up 1.4 percent from 2007. The total tax revenue increase is partially driven by higher state sales and use tax rates started June 1, 2007.

2.3. Beachfront Development and Zoning

There are approximately 10,000 hotel/condo/timeshare units on the oceanfront along Ocean Blvd. Dates of construction vary from the oldest hotel, Chesterfield Inn, constructed in 1946 to current day. Eight Planned Unit Developments (PUDs) have been established in the past 20 years. There are no development agreements which include conditions for rebuilding following damage or construction. All property owners must follow Zoning Ordinance Section 703.7 *Restoration of damaged buildings.* Any nonconforming building damaged by fire, flood, explosion, wind, earthquake, war, riot, or other calamity, or act of God, can be built as it existed immediately before destruction and the nonconforming use (if existing before destruction) can be reestablished if reconstruction and reestablishment occur within 12 months after destruction. However, replacement of destroyed buildings in a floodplain must be elevated in accordance with the provisions of section 909.

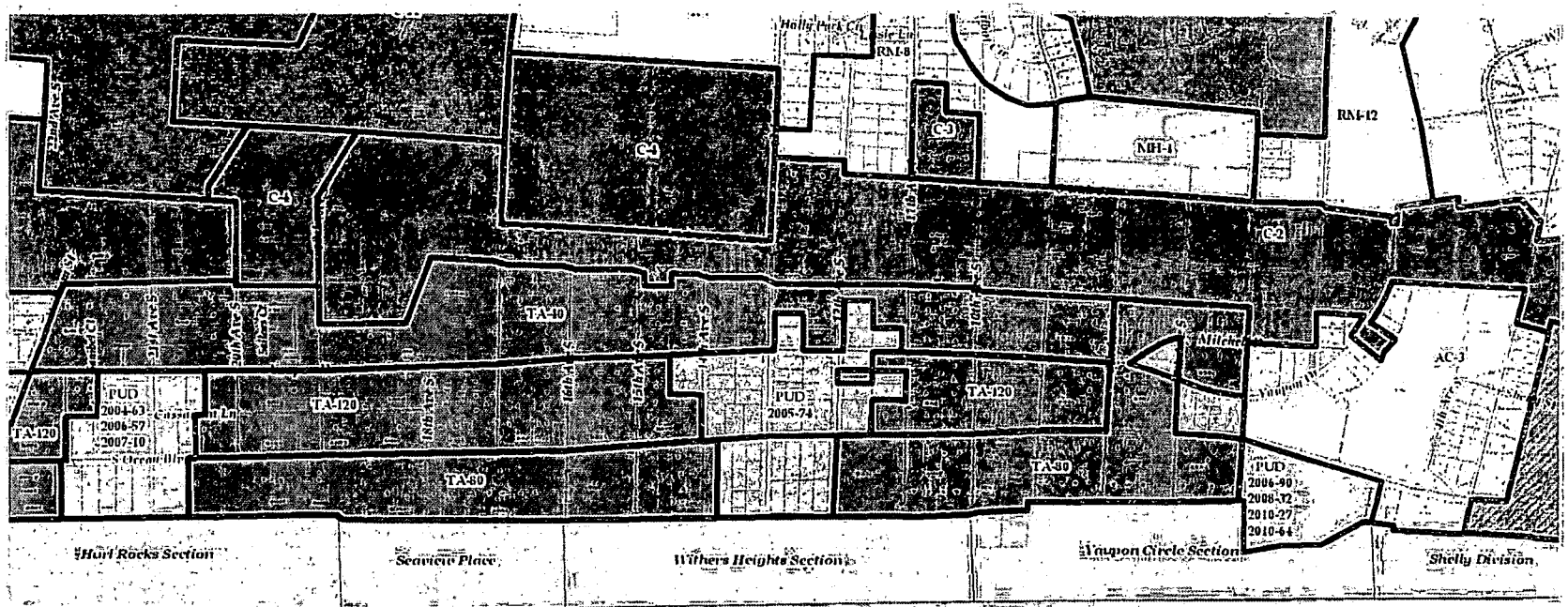
Aerial maps of beachfront development are available on a CD. To obtain a copy contact the City of Myrtle Beach Planning Department at 843/918-1050.

Zoning maps that include the area seaward of the DHEC-OCRM setback line are included on the following pages.



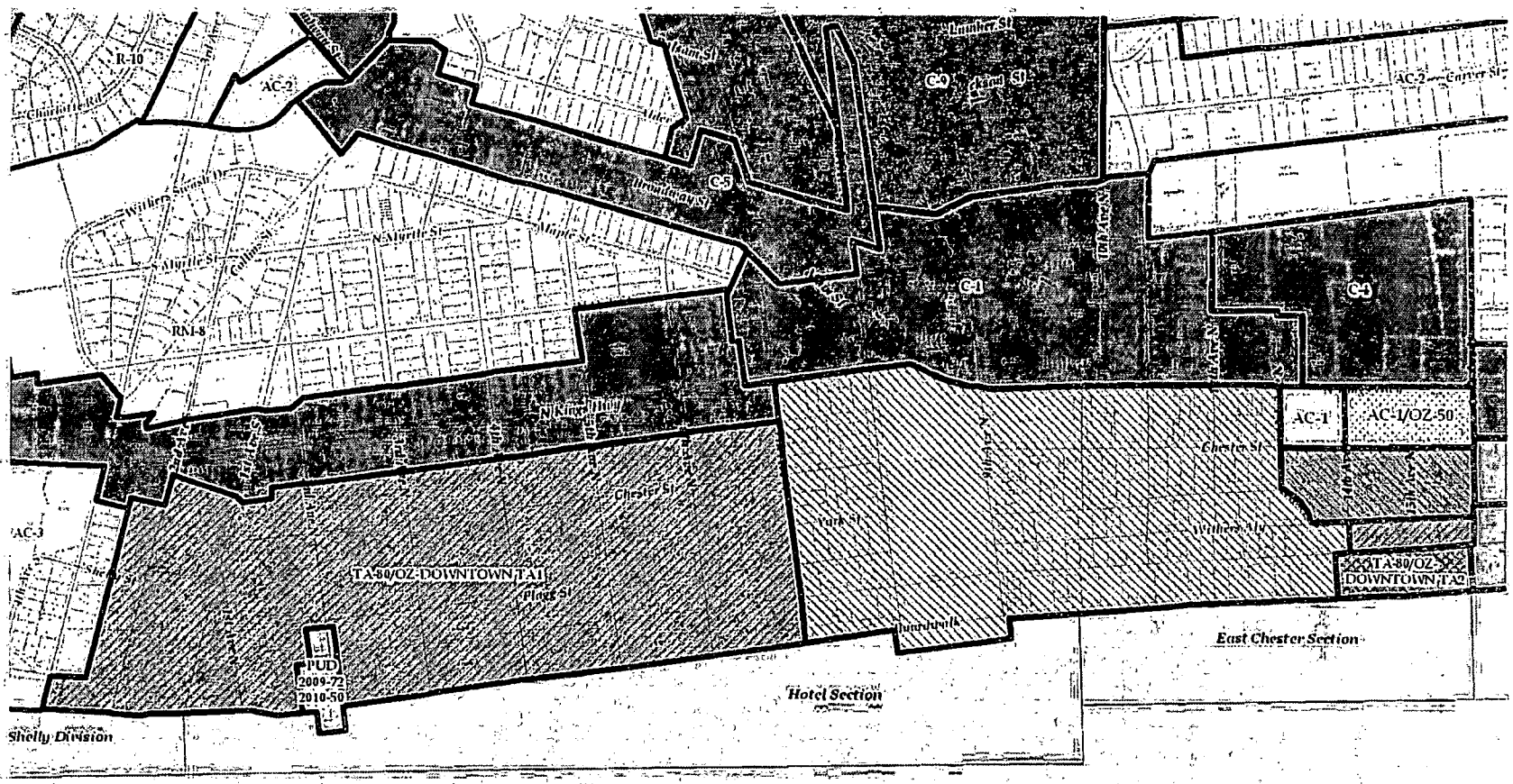
Zoning Map for City of Myrtle Beach

AC-3 Accommodations Commercial District
TA-80 Transient Accommodations District



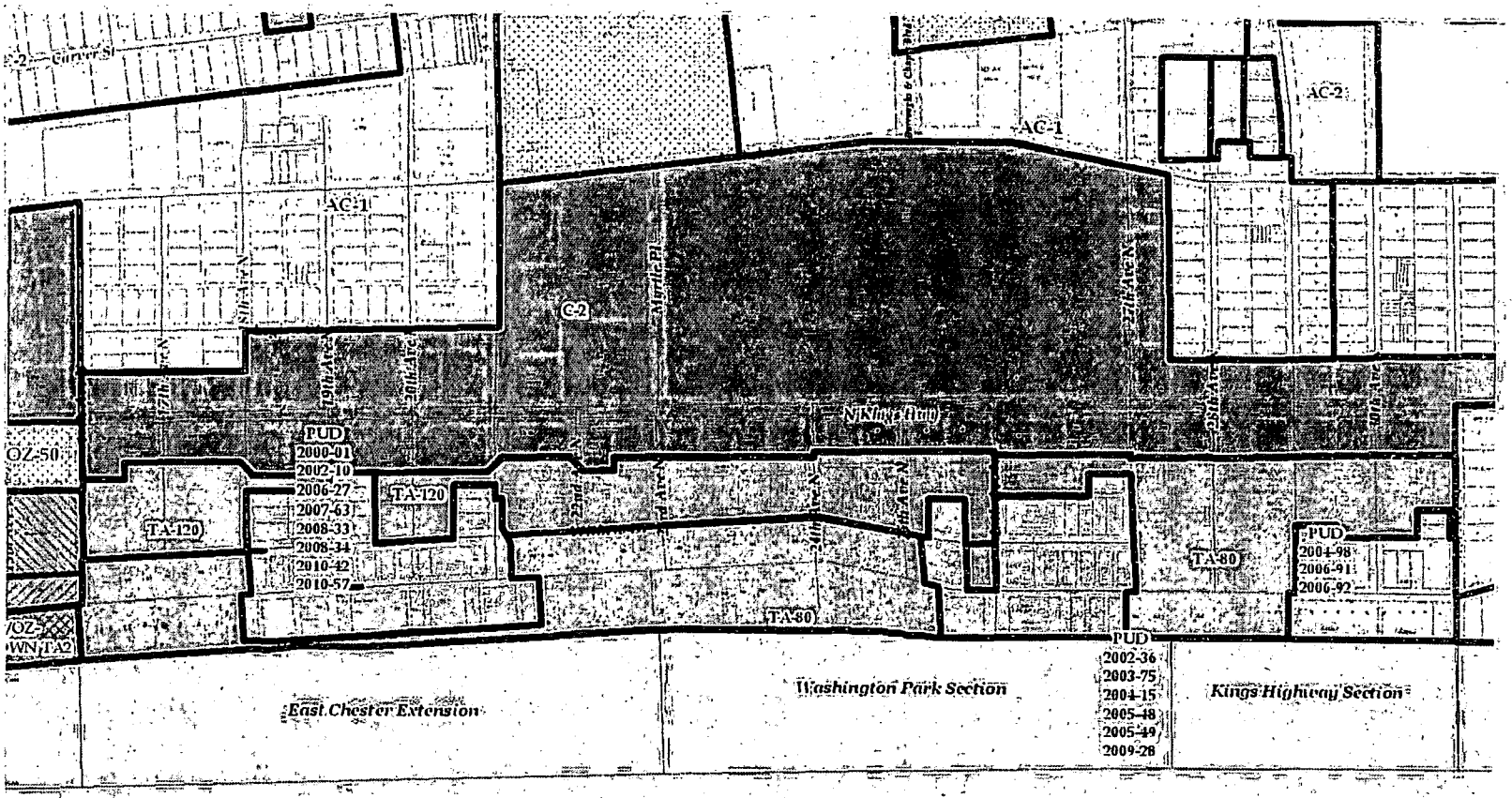
Zoning Map for City of Myrtle Beach

AC-3	Accommodations Commercial District
TA-80	Transient Accommodations District
PUD	Planned Unit Development



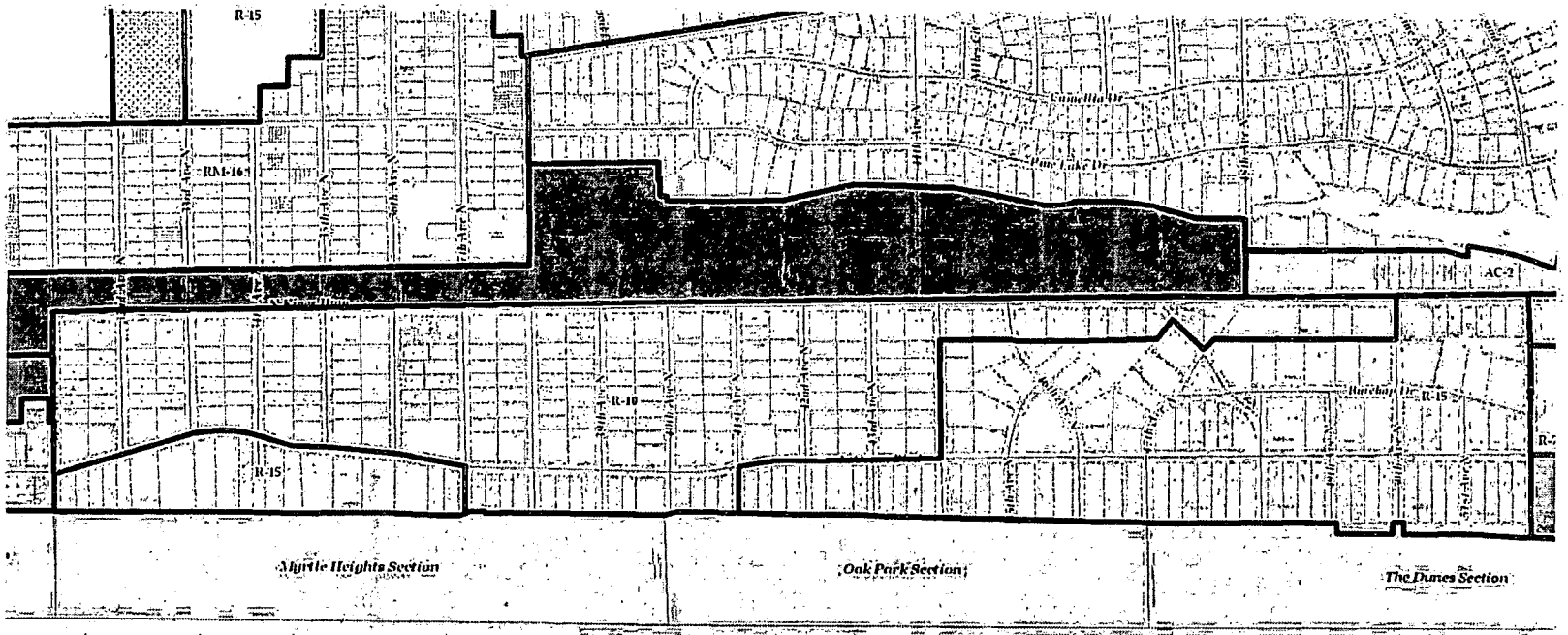
Zoning Map for City of Myrtle Beach

AC-3	Accommodations Commercial District
TA-80	Transient Accommodations District
OZ -TA1	Downtown Overlay Zone
OZ-TA2	Downtown Overlay Zone



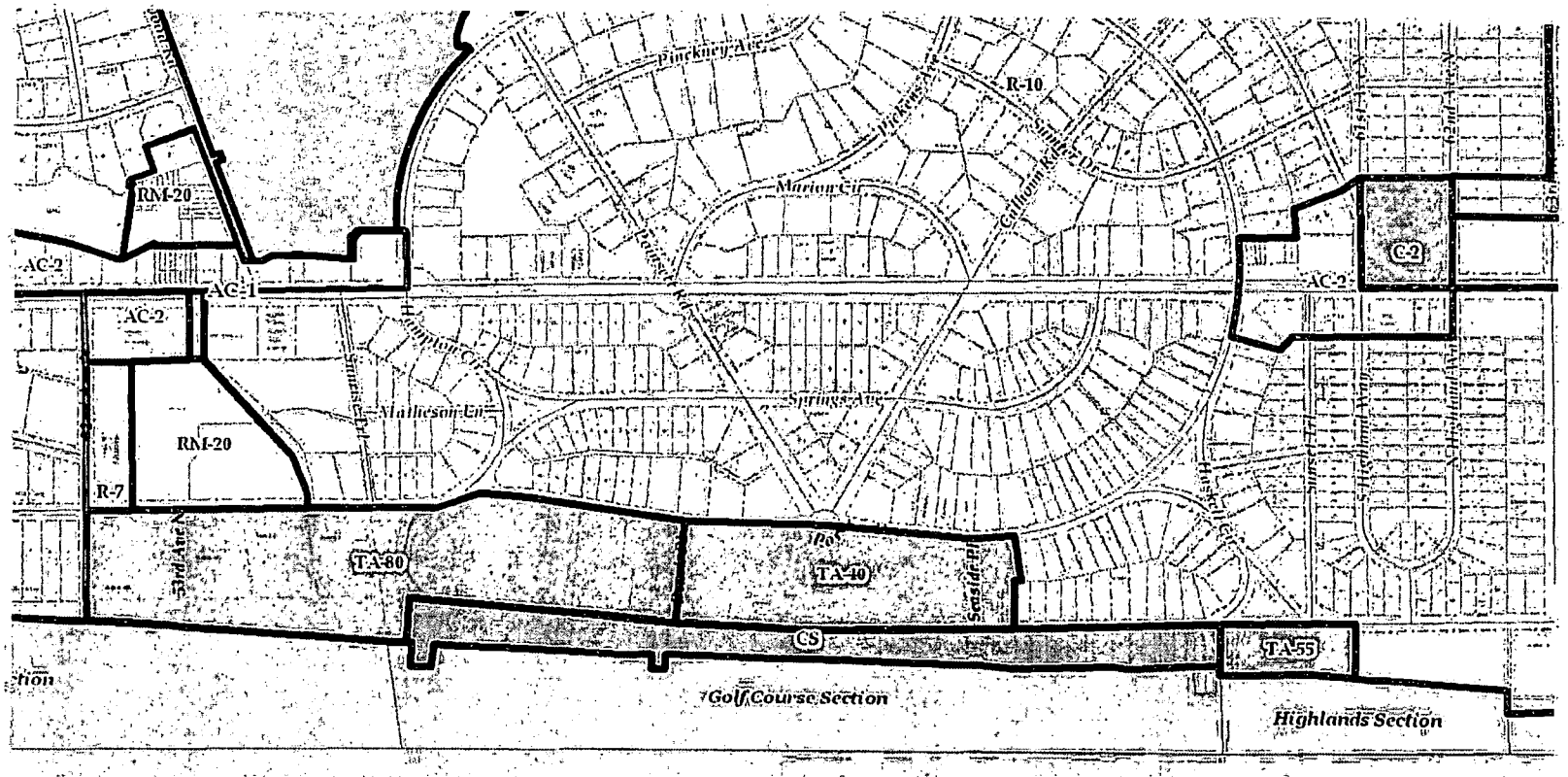
Zoning Map for City of Myrtle Beach

TA-120 Transient Accommodations District
PUD Planned Unit Development



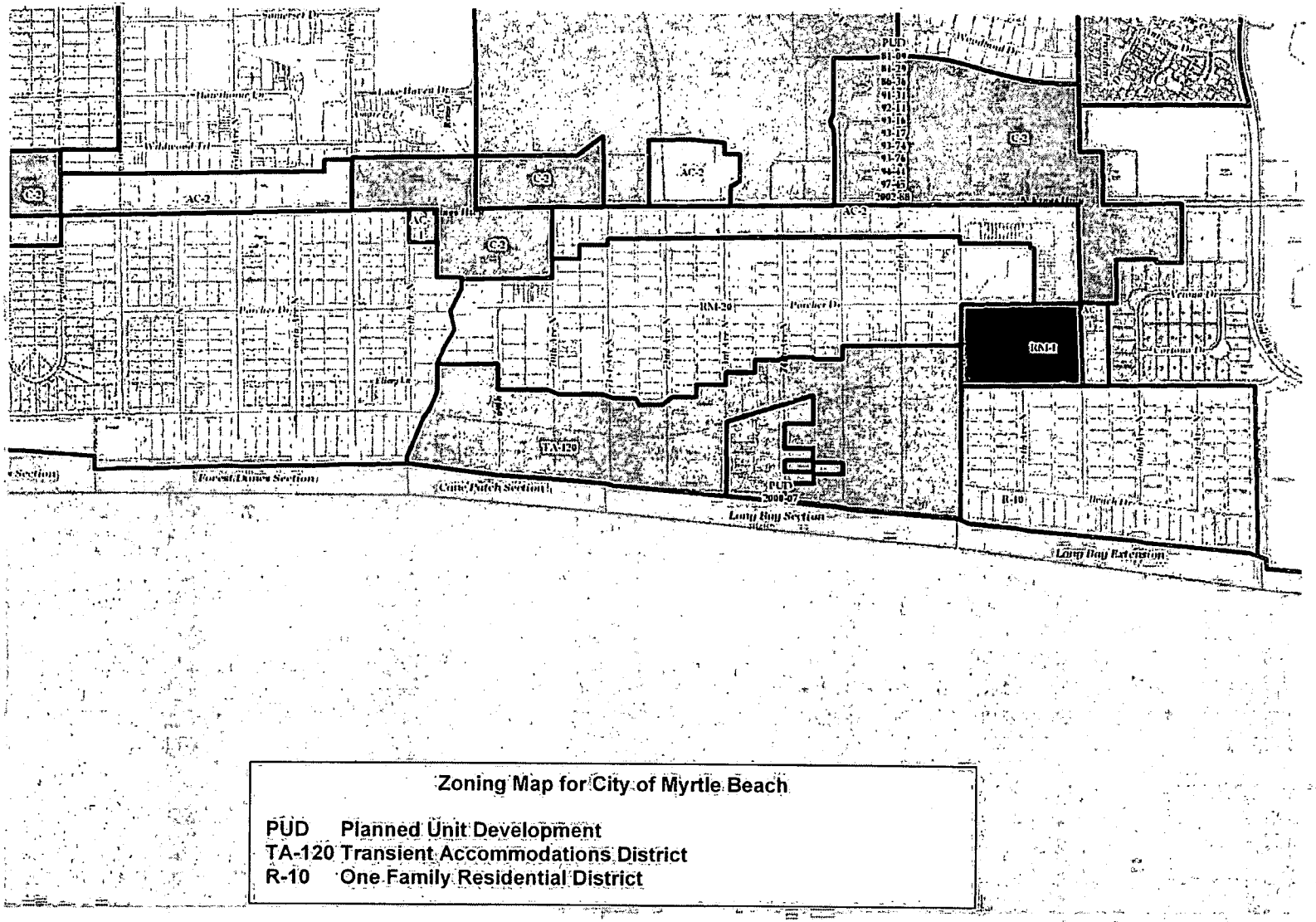
Zoning Map for City of Myrtle Beach

R-15	One Family Residential District
R-10	One Family Residential District



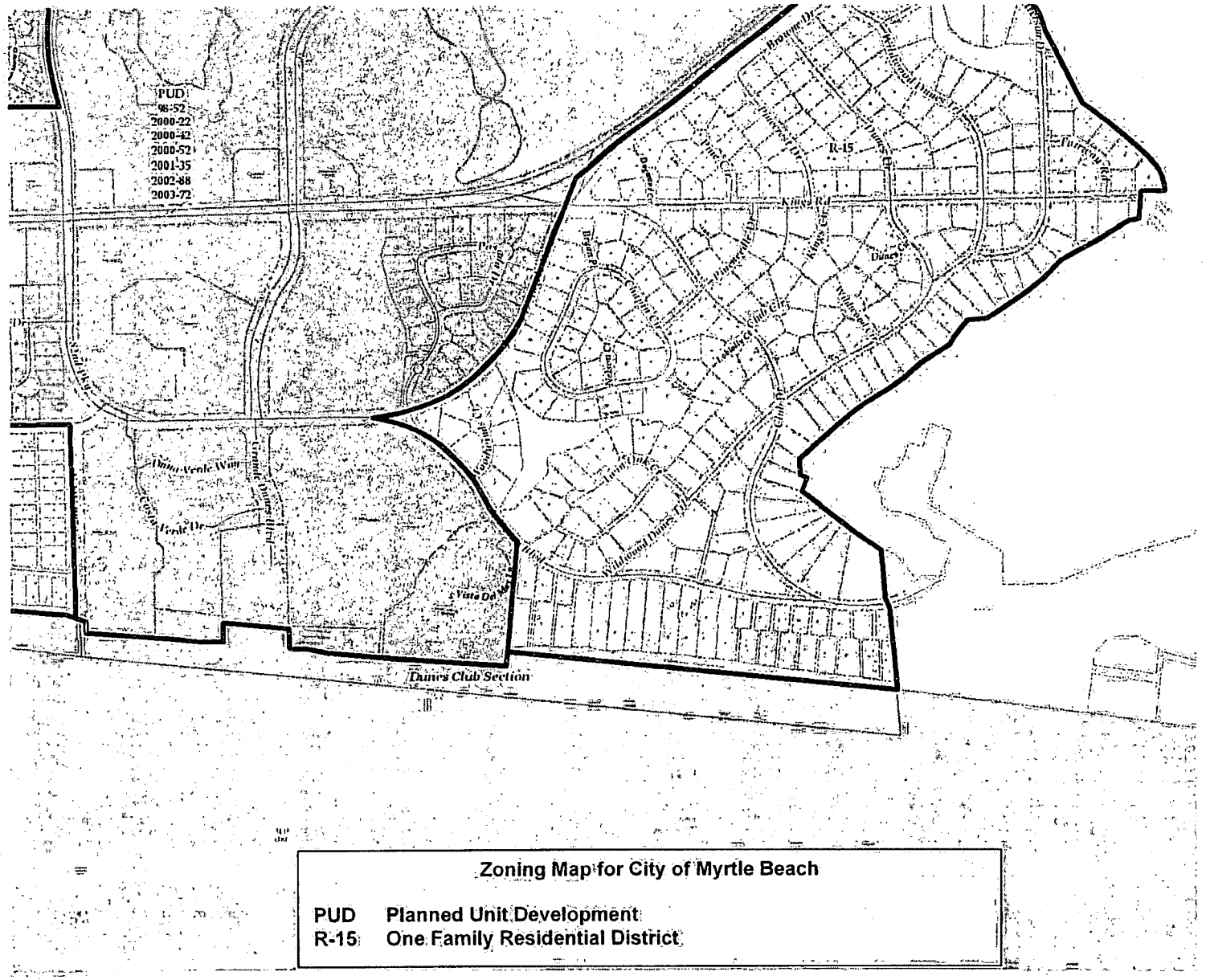
Zoning Map for City of Myrtle Beach

TA-80	Transient Accommodations District
TA-40	Transient Accommodations District
TA-55	Transient Accommodations District
CS	Cabana Section District



Zoning Map for City of Myrtle Beach

PUD Planned Unit Development
TA-120 Transient Accommodations District
R-10 One Family Residential District



Zoning Map for City of Myrtle Beach

PUD	**Planned Unit Development**
R-15	**One Family Residential District**

The requirements for each zoning classification illustrated on the maps above are described as follows:

- AC-3, accommodations commercial district, provides for areas in which the development of transient type facilities and their supporting services are most appropriate, whereby the concentration of such facilities and services would provide for a cumulative "visitor attraction" base greater than that provided for by the establishment of an individual transient accommodation or service.
- TA-40, transient accommodations district, provides for the orderly development of certain areas within the community for both residential and transient accommodation land uses. Maximum height is 40 feet.
- TA-55, transient accommodations district, provides for areas in which the development of transient-type facilities are most appropriate, whereby the concentration of such facilities would provide for a cumulative "visitor attraction" base greater than that provided for by the establishment of an individual transient accommodation. Maximum height is 55 feet.
- TA-80, transient accommodations district, provides for areas in which the development of transient-type facilities are most appropriate, whereby the concentration of such facilities would provide for a cumulative "visitor attraction" base greater than that provided for by the establishment of an individual transient accommodation. Maximum height is 80 feet.
- TA-120, transient accommodations district, provides for areas in which the development of transient-type facilities are most appropriate, whereby the concentration of such facilities would provide for a cumulative "visitor attraction" base greater than that provided for by the establishment of an individual transient accommodation. Maximum height is 120 feet.
- PUD, planned unit development district, provides the method by which tracts of land may be developed as a unit rather than on a lot-by-lot basis as provided in the *Zoning Ordinance*. It is intended to provide a maximum of design freedom by permitting the developer an opportunity to more fully utilize the physical characteristics of the site through the reduction of lot sizes, yards, height and bulk restrictions and the planned mixing of uses. Through the requirement of the development plan, it is the intention that property under the PUD title will be developed through a unified design providing continuity among the various elements causing a better environment. PUDs establish standards and procedures for planned development in accordance with the following objectives: 1) To allow variety and flexibility in land development necessary to meet changes in technology and demand; 2) To allocate, maintain, and preserve common open space, recreation areas and facilities; to offer neighborhood recreational opportunities; to enhance the appearance of neighborhoods through the conservation of natural resources; and 3) To provide a maximum choice in the type of environment available by permitting a development that would not be allowed by other zoning districts.
- OZ Downtown TA1 and TA2, downtown overlay zones, preserves and continues the established downtown amusement, commercial and transient accommodation environment, to allow for a compatible mixture of uses, to increase the development potential of the unusually small downtown land parcels, and to create incentives for the development of oceanfront view corridors and parks.
- R-10, one-family residential district, purposes to:
  a. provide for quiet, livable, low-density residential neighborhoods intended for permanent residential occupancy, as opposed to low-density areas for transient occupancy, and to encourage the formation and continuance of a stable, healthy, residential environment for low-density one-family dwellings situated on lots having an area of 10,000 square feet or more;
  b. discourage unwarranted and blighting encroachments by prohibiting the commercial and industrial use of the land and to disallow any other use which would substantially interfere with the development or continuation of single-family dwellings in the district;
  c. prohibit any use which would substantially interfere with the development or continuation of single-family dwellings in the district;
  d. encourage the discontinuance of nonconforming uses; and
  e. discourage any use which would generate traffic on minor streets other than that required to serve residences on those streets.
- R-15, one-family residential district, purposes to:
  a. provide for quiet, livable, stable low density residential neighborhoods intended for permanent residential occupancy as opposed to low density areas for transient occupancy and to encourage the formation and continuation of a stable, healthy, residential environment for low density one-family dwellings situated on lots having an area of 15,000 square feet or more;
  b. discourage unwarranted and blighting encroachments by prohibiting commercial and industrial use of the land and to disallow any other use which would subsequently interfere with the development or continuation of single-family dwellings in the district;

c. prohibit any use which would substantially interfere with the development or the continuation of residential development;
d. encourage the discontinuance of nonconforming uses; and
e. discourage any use which would generate traffic on minor streets other than that required to serve residences on those streets.

- CS, cabana section, allows the development of private cabanas, incidental to customary swimming and sunbathing activities, and protects the unique scenic qualities of this section.

In addition to the districts delineated on the zoning map, the *Zoning Ordinance* also includes an overlay zone, the CP Coastal Protection District, along the beachfront. The CP district establishes requirements supplementary to the regulations of the mapped zoning district. Properties governed by the CP district are all those east of Ocean Blvd or Beach Drive between the northern and southern limits of the city.

The CP district establishes a baseline or ideal dune crest (in compliance with OCRM's baseline) and a 50-year setback line (6.8 feet, or 10 times the annual erosion rate of 0.68 feet, landward of OCRM's 40-year setback line). The *Zoning Ordinance* and map provide exact locations for the baseline and the 50-year setback line between 82nd Ave N and 29th Ave S.

District regulations retain the list of permitted uses for each of the underlying zones; however, except as noted below, no structures may be built seaward of the 50-year setback line. The exceptions include decks, walkways, gazebos, stairs, lighting, landscaping, portable lifeguard stations, trash receptacles, seating, sand dunes, and vegetation. In addition, open-air amusement uses in the AC-3 district may be built seaward of the setback line and pools in any district may be built within 20 feet of the baseline as a special exception granted by the Board of Zoning Appeals. Storm drains and pool drains are prohibited from being placed on the beach. Clay and other incompatible fill are prohibited on the beach.

Bulkheads, seawalls, revetments or other permanent erosion control structures or devices which existed on June 25, 1990, shall not be repaired or replaced if, as measured by OCRM, they are destroyed more than 50 percent above grade after June 30, 2005. Before the repair or replacement of any erosion control structure is permitted, the applicant must demonstrate to OCRM and the City of Myrtle Beach that all reasonable soft erosion control measures such as sand scraping, sandbagging and renourishment from an approved external sand source have been attempted and will not protect existing permanent improvements which are imminently threatened by erosion. Every effort must be made to renourish the beach and sand dune system from an external sand source approved by OCRM and the City of Myrtle Beach. All applications for the repair or replacement of an erosion control structure shall be prepared and stamped by a registered engineer in the field of civil, structural or coastal engineering licensed to practice in the State of SC. No beach sand shall be used for backfill material during the repair or replacement of any erosion control structure. The property owner must provide stairs to the beach when an erosion control structure is repaired or replaced.

The City's regulations governing the beachfront differ in several ways from OCRM's permitting requirements. The differences involve the determination of the setback area, regulation of activities seaward of the baseline, and requirements for new buildings and parking lots, pools, erosion control structures, and dune walkovers and decks.

The setback used by the City is based on the extent of erosion that is expected within 50 years at the present erosion rate of 0.68 feet annually. OCRM's setback is based on 40 years of erosion. By using a longer period of erosion, the City has a more protective retreat policy.

The City's regulations establish a baseline which is coincident with the OCRM baseline. The City's regulations do not establish requirements for development seaward of the baseline different from those for development landward of the baseline. None are necessary because the prohibition of new development seaward of the 50-year setback line also applies seaward of the baseline. (The City also requires the applicant to obtain a permit from OCRM prior to the City issuing a permit).

The City's regulations prohibit new buildings, including additions to existing buildings, to be constructed seaward of the 50-year setback line. The prohibition exists regardless of the amount of heated space in the building and applies to recreational amenities (except pools), ancillary buildings (except walkways over dunes and decks), and parking lots. OCRM allows habitable structures with no more than 5,000 square feet of heated space to be built seaward of the 40-year setback. The City's regulations are more restrictive for new construction.

The City permits the construction of new pools seaward of the setback line as a special exception granted by the Zoning Board of Appeals; however, the pool can be no closer than 20 feet to the baseline. OCRM's regulations permit new pools seaward of the setback line, provided the pool is landward of an erosion control device that existed prior to 1990.

New beach erosion control devices are not allowed seaward of the setback line by OCRM. The City's regulations as described above state that an erosion control device may be permitted (if erosion eminently threatens a permanent structure and if it can be demonstrated that all reasonable forms of soft erosion control will not provide protection), but the requirement that a OCRM permit be obtained means that no erosion control structures are allowed under City regulations.

The City's regulations do not establish a maximum width for a dune walkway or a maximum size for a deck. OCRM permits walkways no wider than six feet seaward of the baseline and decks no larger than 144 square feet seaward of the 40-year setback line. OCRM prohibits the deck from being seaward of the baseline.

In 2010 City Council amended the CP overlay zone to recognize the public benefit and historic location of deeded pier lots located approximately at 14th Ave N, 2nd Ave N and 54th Ave N, and to provide that deeded pier lots may be the site of new pier structures and permanent improvements related to the pier structures under appropriate State and local permitting.

As of this writing the City of Myrtle Beach City Council is in the process of reviewing a complete rewrite of the *Zoning Ordinance*.

2.3.1 Beachfront Inventory

An inventory table of all structures located seaward of the setback line is located in Appendix E. The structural inventory includes tax map numbers of all parcels with structures located seaward of the setback line. The type of structure is noted (i.e. habitable structure ≥ 5,000 sq. ft., habitable structure < than 5,000 sq. ft., deck, fence, pool, parking lot, and pier. The inventory also includes how far the structure is located seaward from the setback line (ft.)

Maps of the structures along the oceanfront is available on CD. To obtain a copy contact the City of Myrtle Beach Planning Department at 843/918-1050.

2.4. Natural Resources and Ecological Habitats

2.4.1 Beach and Sand Dune Habitats

Landward of the open beach is the dune system. Dunes are generally low-lying areas vegetated with salt-tolerant plants that hold and trap windblown sands. The dune system in Myrtle Beach is home to plants such as sea oats, bitter panicum, and American beach grass. Sea oats is a strong plant which is drought and heat tolerant and relatively free of pests. Bitter panicum grass is extremely hardy and a rapid grower. American beachgrass is an excellent dune stabilizer, grows rapidly, and effectively traps sand.

According to the Interpretive Ranger at Myrtle Beach State Park foxes, raccoons, yellow rat snakes, six lined racerunners, cottontail rabbits, ghost crabs, numerous birds, butterfly and other insect species have been observed in the park area which is adjacent to the city limits of Myrtle Beach.

2.4.2 Threatened and Endangered Species

The Federal and State governments have separate lists of rare, endangered and threatened species. For both lists, an endangered species is one which is in danger of extinction throughout all or a significant portion of its range, and a threatened species is likely to become endangered within the foreseeable future. The SC Department of Natural Resources (DNR) has identified certain species as being of special concern because of reduced numbers or loss of habitat, food sources, or ranging area. See "Rare, Threatened and Endangered Species and Communities Known to Occur in Horry County, SC" table below (note: Animals and plants listed below not specifically described as "threatened" or "Endangered" are considered "Rare").

Rare, Threatened, and Endangered Species and Communities Known to Occur in Horry County, SC
March 2, 2010

Scientific Name	Common Name	USESA Designation	State Protection
Vertebrate Animals			
Caretta caretta	Loggerhead	LT: Listed threatened	ST-Threatened
Clemmys guttata	Spotted Turtle		ST-Threatened
Corynorhinus rafinesquii	Rafinesque's Big-eared Bat		SE-Endangered
Fundulus diaphanus	Banded Killifish		
Haliaeetus leucocephalus	Bald Eagle		SE-Endangered
Heterodon simus	Southern Hognose Snake		
Mycteria americana	Wood Stork		SE-Endangered
Picoides borealis	Red-cockaded Woodpecker	LE: Listed endangered	SE-Endangered
Pituophis melanoleucus	Pine or Gopher Snake		
Sterna antillarum	Least Tern		ST-Threatened
Ursus americanus	Black Bear		
Invertebrate Animal			
Elliptio congaraea	Carolina Slabshell		
Lampsilis splendida	Rayed Pink Fatmucket		
Villosa delumbis	Eastern Creekshell		
Animal Assemblage			
Waterbird Colony			
Vascular Plants			
Agalinis aphylla	Coastal Plain False-foxglove		
Agalinis maritima	Salt-marsh False-foxglove		
Amaranthus pumilus	Seabeach Amaranth	LT: Listed threatened	
Andropogon mohrii	Broomsedge		
Anthaenantia rufa	Purple Silkyscale		
Asclepias pedicellata	Savannah Milkweed		
Balduina uniflora	One-flower Balduina		
Calamovilfa brevipilis	Pine-barrens Reed-grass		
Calopogon barbatus	Bearded Grass-pink		
Chamaedaphne calyculata	Leatherleaf		
Coreopsis gladiata	Southeastern Tickseed		
Coreopsis integrifolia	Ciliate-leaf Tickseed		
Coreopsis rosea	Rose Coreopsis		
Crotonopsis linearis	Narrowleaf Rushfoil		

Scientific Name	Common Name	USESA Designation	State Protection
Dionaea muscipula	Venus' Fly-trap		
Echinodorus tenellus	Dwarf Burhead		
Eupatorium recurvans	Coastal-plain Thorough-wort		
Fimbristylis perpusilla	Harper's Fimbry		
Helenium brevifolium	Shortleaf Sneezeweed		
Helianthemum georgianum	Georgia Frostweed		
Ilex amelanchier	Sarvis Holly		
Juncus abortivus	Pinebarren Rush		
Lachnocaulon beyrichianum	Southern Bog-button		
Lechea torreyi	Piedmont Pinweed		
Lilaeopsis carolinensis	Carolina Lilaeopsis		
Lipocarpha micrantha	Dwarf Bulrush		
Litsea aestivalis	Pondspice		
Lygodium palmatum	Climbing Fern		
Minuartia godfreyi	Godfrey's Stitchwort		
Oxypolis ternata	Piedmont Cowbane		
Parnassia caroliniana	Carolina Grass-of-parnassus		
Peltandra sagittifolia	Spoon-flower		
Physostegia leptophylla	Slender-leaved Dragon-head		
Plantago sparsiflora	Pineland Plantain		
Pteroglossaspis ecristata	Crestless Plume Orchid		
Pyxidanthera barbulata	Flowering Pixie-moss		
Pyxidanthera barbulata var. barbulata	Well's Pyxie Moss		
Rhynchospora oligantha	Few-flowered Beaked-rush		
Ruellia pedunculata ssp. pinetorum	Stalked Wild Petunia		
Sabatia bartramii	Bartram's Rose-gentian		
Sabatia kennedyana	Plymouth Gentian		
Sarracenia rubra	Sweet Pitcher-plant		
Schwalbea americana	Chaffseed	LE: Listed endangered	
Scleria baldwinii	Baldwin Nutrush		
Solidago pulchra	Carolina Goldenrod		
Sporobolus teretifolius	Wire-leaved Dropseed		
Stylisma pickeringii var. pickeringii	Pickering's Morning-glory		
Tofieldia glabra	White False-asphodel		
Xyris brevifolia	Short-leaved Yellow-eyed Grass		
Xyris flabelliformis	Savannah Yellow-eyed Grass		

The US Department of Fish and Wildlife records two Federally listed species, the threatened loggerhead sea turtle and Seabeach Amaranth, within the beach/dune system of SC. According to DNR there is no data available on loggerhead sea turtle nesting sites in Myrtle Beach.

The City has in place ordinances which help with the protection of endangered and threatened species although the ordinances were not adopted for that purpose. Section 916.12 of the City's light and glare ordinance addresses the prevention and minimization of hazards to nesting female sea turtles and their hatchlings on the beach between 31st Ave N and 52nd Ave N, between Highland Ave and Canepatch Swash and between 77th Ave N and the northern boundary of the city. *City of Myrtle Beach Code of Ordinances*, Chapter 4, Section 6 prohibits pets from running at large beyond its owner's property. That leash law prevents dogs and cats from wandering unattended and damaging turtle and bird nests. Chapter 5, Section 2 authorizes only City work and emergency vehicles on the beach. Other vehicles, which may be used maliciously or unintentionally to damage nests, are prohibited.

The Beach Patrol and the Department of Cultural and Leisure Services are responsible for locating, marking and securing turtle nests until a representative from Myrtle Beach State Park can relocate the eggs to a safer area within the State Park.

2.5. Existing Public Access Inventory

The number and distribution of public access points provide sufficient access facilities and parking to classify 100% of Myrtle Beach as having full and complete public access per the State guidelines (SCCC, 1995). DHEC-OCRM recognizes that full and complete public access is provided along 10 miles of beach.

There are 395 beach access points in the city with 145 being publicly maintained and accessible to the general public. All of the publicly owned beach accesses are marked by a sign.

When the street system was originally laid out, streets (between 10th and 29th Aves N) and alleys were extended eastward to the beach. Those street ends and alleys today serve as public access to the beach. The street ends and alleys serve as 145 publicly owned access points between 29th Ave S and 9000 N Ocean Blvd., an average of more than 14 access points per mile. The access points are spaced out fairly evenly along the beach between those streets, except that a concentration of access points, spaced approximately 60 feet apart, is located between 10th and 29th Aves N.

Ramps located at 54 of the 145 public access points serve as access for the physically challenged. Thirty-seven percent of the City's access points are designated as handicapped accessible.

All properties along the beachfront provide access to and from the beach. Most private properties with oceanfront outdoor refreshment and restaurant areas are open to the public. They serve the paying customer and discourage the nonpaying public, although it is acknowledged that hotels provide the opportunity for millions of people each year to enjoy the beach.

In April 2010 the City opened a 1.2 mile boardwalk between 14th Ave N and 1st Ave S along the oceanfront. This boardwalk creates 1.2 miles of public beach access and meets ADA guidelines while providing an opportunity for many to view the oceanfront that might otherwise be physically challenged in accessing it. Bike racks are provided at all street ends near the boardwalk.

Other than the public and private access points discussed above, access is physically impeded by sand fences or the dune for almost all of the length of the beach. Signs are placed along the beach asking people not to walk on the dunes.

There are 30 designated emergency access points, where a cut in the dunes exist, in order to provide emergency vehicular access to the beach. These access points are widely scattered up and down the beach and are positioned to provide access around such obstacles as swashes and fishing piers. Each emergency access is marked at the seaward edge of pavement with traffic regulation signage. The signs identify the area as an emergency access and prohibit parking between the signs.

There are a total of 897 public parking spaces located at these beach access points with an average of 15.3 spaces per access location. On-street metered parking is also available along Ocean Boulevard (south end) with additional on-street parking on adjacent streets within short walking distance of all beach access points. The Pavilion parking garage, leased by the Myrtle Beach Downtown Redevelopment Corporation (DRC), is located at the corner of Chester Street and 9th Ave N. The garage provides 1,000 public parking spaces less than 900 feet from the oceanfront boardwalk. Although those spaces are further than 500 feet from the beach access point, they are nevertheless conveniently located and well marked for beach-goers in search of a place to park. In addition the DRC has leased a parking area at 6th Avenue North and Ocean Boulevard providing 54 parking spaces less than 500 feet from the 6th Avenue North beach access. Additional public parking is located in the front lot of the 2nd Ave Pier parking lot. Handicapped designated parking stalls are located at 31 public access locations with 56 spaces available. Twenty public access points have designated golf cart parking.

ADA compliant portable restrooms are located adjacent to the parking garage on Chester Street. Portable public restroom facilities are also located at Hurl Rock Park, 5th Ave N, 8th Ave N, 7th Ave N, Plyler Park, 24th Ave N and Gardens by the Sea.

Shower towers are available at 79 beach access points. Drinking fountains are located at 8 public access points. Trash receptacles are located at 69 public access points and cigarette canisters at 32. An additional 362 trash receptacles are on the beach during the summer and approximately 181 during the winter months. Dog waste bags are conveniently located at the beach access points in the Cabana section for pet owners.

Swings and playgrounds are located at 2402 N Ocean Blvd. and Gardens by the Sea and swings only at 34th and 37th Aves N.

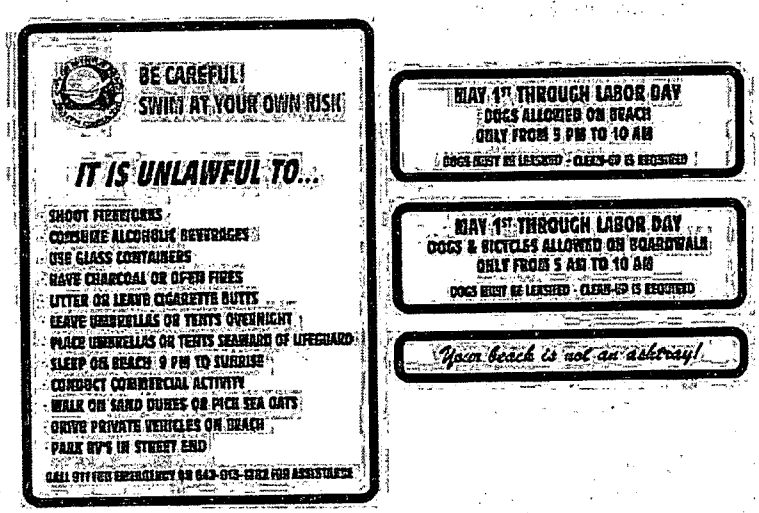
Regulatory signs are located at 94 public access locations and 3 private. Dune walkover decks with seating are located at 87 public access locations and 18 private. Dune walkover decks without seating are located at 20 public access locations and 100 private. Steps and footpaths are located at 68 public access locations and 134 private.

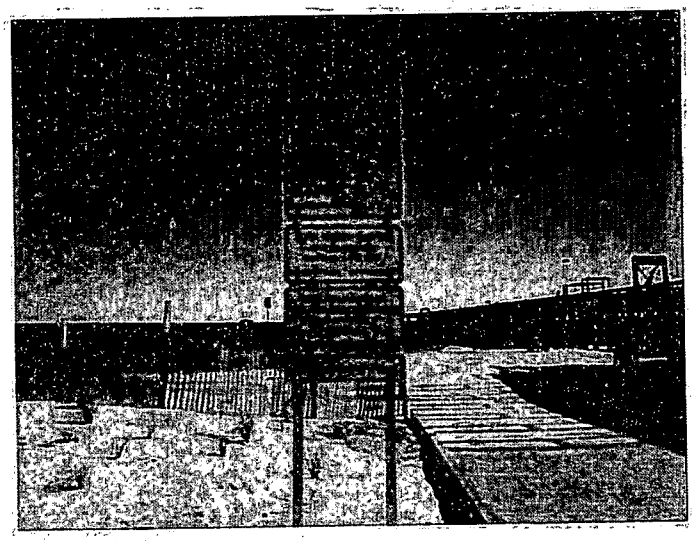
The City contracts with companies to provide water safety. In exchange the companies are given franchises for chair and umbrella rental concessions. The entire beach is covered by either standing or roving lifeguards. Lifeguards are stationed

along the beach as follows: 29th Ave S to 31st Ave N, 38th Ave N, 52nd Ave N to 61st Ave N, 68th Ave N to 77th Ave N, 82nd Ave N to the 8700 block of N Ocean Blvd. Lifeguards are supplemented by the Police Department's Beach Patrol and the Fire Department. The Beach Patrol, all certified lifeguards, provides law enforcement and safety services on the beach throughout the year.

Concessions including food and other items are available from businesses, restaurants and hotels throughout the oceanfront area. In 2010 City Council approved special permits for vending carts to sell food and non-alcoholic drinks at designated beach access points along the boardwalk. The carts can be found 4th, 5th, 6th, and 7th Aves N. These are located in areas that would not compete with established businesses. These vendors are restricted to selling only items approved by Council such as: one lemonade vendor, one hot dog vendor, etc.

Examples of the signage placed at the beach access points are illustrated below.





2.51 Full and Complete Public Access

The number and distribution of 141 public access points in Myrtle Beach provide full and complete access as defined by OCRM. The table in Appendix A shows the public access points and amenities associated with each.

3.0. Beachfront Drainage/Stormwater Management Plan

Myrtle Beach is essentially an island with all of its drainage flowing either to the Atlantic Intracoastal Waterway or to the Atlantic Ocean. Approximately 60 percent of the city's runoff flows to the ocean. The city is separated into seven large drainage basins that drain to the Atlantic. From south to north these basins are Midway, Yaupon, Withers, 24th Ave N, Deephead, Canepatch, and Bear Branch. While there are many smaller basins dotted along the ocean front, these seven basins account for more than 90 percent of the runoff to the ocean. Withers is by far the largest contributor to ocean runoff and accounts for approximately 25 percent of the entire city's area runoff.

As Myrtle Beach developed, very little attention was given to storm water runoff. When the SC Department of Transportation (SCDOT) originally constructed Ocean Blvd and Kings Highway, the ocean was the nearest receiving water body for drainage and pipes were placed from these roadways directly onto the beach. With the increased construction of commercial and multi-family projects, impervious areas grew quickly throughout the city with very little overall improvement to the drainage facilities. Flooding quickly became a major issue in many parts of the city during the 1970's and 1980's. In the fall of 1985, City Council passed a storm water ordinance that in effect limited post construction runoff rates to those of pre-development conditions. While this has worked well for new development and redevelopment, it did little to address the flooding conditions that were already in place. During the late 1980's and throughout the 1990's, City staff addressed many small area flooding issues but were limited in funding to tackle the larger issues. In 2000, City Council tasked staff to come up with a long term plan to address each basin's problems and arrive at an estimated cost to fund the improvements to limit the existing flooding problems. With these estimates in hand, Council placed a referendum on the ballot to issue bonds for up to $25 million to address the problems as outlined. The referendum was adopted in 2001 and staff set out on a multi-year effort to design and construct the basin wide improvements to limit the flooding problems. Shortly after this process began, the City also received a State Revolving Fund (SRF) loan, administered by SCDHEC, of just over $13 million to address one other basin that outfalls onto the beach at 14th Ave N.

As design plans were finalized for three of these large projects, the concept was developed to use deep ocean outfalls to carry storm water off the coast thus eliminating beach pipes dumping storm water directly into the swim zone. These pipes ranged from 2-60" lines at 25th Ave S and Deephead Swash to 2-84" lines at 14th Ave N. With the implementation of this plan, filters were put in place on all of these outfalls to prohibit trash, sediment, and hydrocarbons from entering the ocean. Bacteria has always been a pollutant of concern for drainage into the swimming zone and with the outfalls being 1000' offshore, this addressed the problem in the outfall locations. The ocean's salinity kills bacteria in a relatively short period of time and testing of the ocean waters around the outfall locations has proven that the bacteria plume does not travel anywhere close to the swimming zone before dissipating.

With the development of plans to address the basin wide issues of flooding in the city, emphasis was placed on cleaning up the pollutants in these waters. Several methods were employed utilizing large retention ponds with aerating fountains, vegetated ditch banks, and mechanical treatment vaults such as Stormceptors, CST Units, Vortecnic Units, and other manufactured devices.

In January 2006 Myrtle Beach was designated as a Municipal Small Separate Storm Sewer System (MS4) and placed under a National Pollutant Discharge Elimination System (NPDES) permit for storm water discharge. This permit was derived from the *Clean Water Act, US Code § 1251 et. seq.* of the *Federal Register*. This Phase II permit was issued to all metropolitan areas within SC except for the very large metro areas which were designated as Phase I communities in a previous permit cycle. With the permit, the City is required to meet six minimum control measures, all with the intent of reducing the pollutants from storm water discharges. Myrtle Beach has been very proactive in meeting the goals of this permit long before the requirements were put in place. The City has an active program to address new construction project runoff, locate and eliminate illicit discharges to the storm sewer system, train its employees in pollution prevention, inspect existing properties for rule compliance, and educate the public in storm water pollution prevention. All new development and redevelopment, either public or private, must meet the goals of storm water pollution prevention.

As mentioned previously, many of the drainage pipes in the city discharge directly onto the beach. Over the years, City crews have combined as many pipes as possible thus having one larger outfall in the place of several smaller pipes. The City has long range plans to do additional deep ocean outfalls which would eliminate many more of the existing pipes

along the beach. Two current outlets at 4th Ave N and 24th Ave N have had preliminary engineering studies completed and 4th Ave N has construction plans in place. The City continues to seek funding to construct these projects.

The City's Public Works Department maintains the current system of pipes along the beach front. On a weekly basis during the tourism season and after any heavy rainfall, crews with heavy equipment will traverse the beach and fill and dress around all the outlet pipes to keep them in proper working order and safe for the walking public. Signs on each pipe cradle advise the public that the runoff from these pipes is from storm water discharge and may not meet recreational swimming water standards. The City's maintenance program for all storm water operations is funded by a storm water utility fee that produces approximately $1.5 million per year and is billed monthly on water bills. This recurring revenue allows the city to have an aggressive storm water maintenance program. City staff has become very proactive in determining the source and type of pollution in storm water runoff and has an active program to reduce this problem prior to it reaching the beach outfalls and the Intracoastal Waterway.

A table of beach outfall pipes seaward of the setback line can be found below. Maps indicating outfalls seaward of the setback line are located in the appendices.

Beach Outfall Pipes

Unit Identification #	Location of Pipe	Size and Type of Pipe CMP = Corrugated Metal Pipe CPP = Corrugated Plastic Pipe AL = Aluminum Pipe RCP = Reinforced Concrete Pipe PCCP = Pre-stressed Concrete Cylinder Pipe
27S - 001	27th Ave S	18 in CMP
26S – 043	26th Ave S	15 in AL
25S – 066	25th Ave S	60 in RCP
25S – 065		
21S – 001	21st Ave S	18 in RCP
20S – 001	20th Ave S	18 in CMP
18S – 005	Between 17th and 18th Ave S	30 in RCP
15S – 001	15th Ave S	18 in RCP
13S – 001	13th Ave S	18 in RCP
11S – 001	11th Ave S	24 in RCP
09S – 066	9th Ave S	18 in CMP
08S – 001	8th Ave S	18 in CMP
06S – 001	6th Ave S	18 in RCP
03S – 002	3rd Ave S	15 in CMP
01N – 010	1st Ave S	15 in CMP
01NW – 001	1st Ave N	15 in CMP
03N – 001	3rd Ave N	24 in CMP
04N – 005	4th Ave N	15 in CMP
05N – 001	5th Ave N	24 in CMP
06N – 001	6th Ave N	24 in CMP
07N – 001	7th Ave N	24 in CMP
08N – 002	8th Ave N	
14N – 095	14th Ave N	84 in RCP
14N - 096		
20N – 019	2000 N Ocean Blvd	18 in CMP (Private)
21N – 249	21st Ave N	36 in CMP
24N – 001	24th Ave N	36 in RCP
24N - 002		
25N – 016	Between 25th and 26th Ave N	15 in CMP
26 N – 038	Between 26th and 27th Ave N	24 in CPP
26N – 039		24 in CMP
28N – 007	Between 28th and 28th Ave N	30 in CMP
31N – 030	31st Ave N	24 in CMP
36N – 019	3502 N Ocean Blvd	30 in CMP

37N – 001	37th Ave N	30 in CMP
40N – 001	40th Ave N	18 in RCP
44N – 045	44th Ave N	24 in RCP
49N – 001	49th Ave N	18 in CMP
53N – 001	53rd Ave N	60 in PCCP
53N - 002		
BHP – 001	Beach Pl	24 in CMP
SEP – 001	Seaside Pl	24 in RCP
HAS – 127	Haskell Cir	36 in CMP
HAS – 001		
OBP – 019	Between 68th and 69th Ave N	42 in CMP
OBP – 020		60 in CMP
CAR – 088	70th Ave N	30 in CMMP
71N – 005	71st Ave N	18 in CMP
72N – 017	72nd Ave N	18 in CMP
73N - 014	73rd Ave N	24 in CMP
74N – 003	74th Ave N	18 in CMP
75N – 026	75th Ave N	18 in CAP
77N – 004	77th Ave N	24 in CMP
80N – 001	80th Ave N	15 in RCP
Actively seeking to enhance beach pipe outfall data set to include beach outfall pipes from private drainage systems (~8 additional pipes).		

Supporting ordinances associated with Stormwater Management Plan are located in Appendix B.

The Stormwater Management Plan is found in Chapter 18 of the *City Code of Ordinances*. The objectives of this chapter are to protect, maintain and enhance the health, safety and general welfare of the citizens of the city; to decrease the degradation of the beaches; to prevent damage to property from improper drainage and flooding; and to protect drinking water supplies.

The following regulatory documents govern the criteria set forth in this chapter:
(1) Standards of Stormwater Management and Sediment Reduction SCDHEC Regulation 72-305 "Permit Application and Approval Process" and 72-307 "Specific Design Criteria, Minimum Standards, and Specifications".
(2) NPDES General Permit for Stormwater Discharges from Large and Small Construction Activities [Permit No.: SCR100000].
(3) NPDES General Permit for Stormwater Discharges from Regulated Small Municipal Separate Storm Sewer Systems (MS4s) [Permit No.: SCR030000].
(4) South Carolina Department of Health and Environmental Control Office of Ocean and Coastal Resource Management's (SCDHEC-OCRM's) Coastal Zone Management Plan [Coastal Zone Management Act, South Carolina State Law, Title 48, Chapter 39] Stormwater Management Guidelines.

4.0 Beach Management and Authorities

4.1. Public Trust Doctrine

In its historical foundation, the *Public Trust Doctrine* requires that waters remain usable for the purposes of navigation (including small boats), related commerce, and fishing; that is, those water-based benefits held in trust for the enjoyment of each state's citizens. The doctrine has expanded to include aesthetic beauty, recreation, and preservation of natural conditions of submerged and riparian lands. The *Public Trust Doctrine* has developed differently in each state, but it generally requires that subject waters, lands, and dependent fishery and wildlife resources be managed for the benefit of each state's citizens to ensure long-term sustainability for trust purposes. In this sense, the doctrine can be considered a type of fiduciary responsibility of the government to manage specific resources for the general, sustained benefit of its citizens.

The *Public Trust Doctrine*, which originated as *Roman Civil Code* in the sixth century A.D., stated that, "By the law of nature these things are common to mankind--the air, running water, the sea, and consequently the shore of the sea." England adopted the *Public Trust Doctrine* as common law, and the *French Civil Code* and *Spanish Civil Law*, likewise, acknowledged the concept of common property. In turn, the *Public Trust Doctrine* was imported into the 13 original US

colonies. Following independence of the colonies, the *Public Trust Doctrine* potentially became part of the basic law in each state. It remains valid today as common law in jurisdictions where its principles have been enacted in statutory laws (including the implementation of rules and policies) to manage subject waters and lands.

Pursuant to the *Public Trust Doctrine*, states hold the waters of navigable streams and their non-navigable tributaries, submerged lands, and fishery and wildlife resources in trust for the benefit of all people. These public resources must be used in a manner consistent with the enjoyment of public trust benefits as provided by the *Public Trust Doctrine*. Principally, the doctrine forms the "bedrock of modern (fish and) wildlife regulation". It is under the *Public Trust Doctrine* that courts and state legislatures have recognized their basic sovereign obligation to act in the best interests of their citizens and developed legal authorities for the states to control the management and use of fishery, wildlife, and water resources that are held in trust for the public.

State governments may also have trust responsibility and obligations for other natural resources. In some jurisdictions, the trust has been interpreted to include the protection of fish and wildlife habitat, coastal access and aesthetic characteristics, as well as traditional trust resources. Another application of the public trust may include the protection of public health and prevention of flooding, erosion, and water pollution.

In SC the State is steward, and under certain laws like the *Beachfront Management Act* and others, has allowed the cities and counties to act in their stead in protecting the public trust, but only as ordered and allowed by law.

The *PublicTrust Doctrine* protects the right of the public to pass along the shoreline up to the mean high water line and utilize the space for fishing, navigation or recreation. The *Public Trust Doctrine* does not authorize the public to trespass on upland private property in order to access the beach. However, the doctrine does help preserve and protect the right of the public to access and utilize the beach.

In SC, as with much of the US, the *Public Trust Doctrine* has been at the center of numerous court cases and deliberations and will likely continue to be. This doctrine is at the core of the philosophy of coastal zone management and should be recognized and considered by the government, private landowners, and the public at large in the course of decision-making along the beach.

Myrtle Beach adheres to the *Public Trust Doctrine* by providing 142 public access points along the 10 miles of oceanfront. This access includes areas for fishing, navigation and recreation. The City, through its *Code of Ordinances* and beach management procedures, preserves and protects the right of the public to access and utilize the beach.

4.1.2 Federal and State Agencies and Jurisdiction

Numerous Federal and State agencies have responsibility or authority for assisting in the management of the beach. A summary of the agencies with regulatory or management authority and a discussion of their authority as relevant to beach management in Myrtle Beach is provided in Appendix **C**.

4.2 Beachfront Setback Area

The State of SC established a policy of retreat from eroding beaches as part of the Beachfront Management Act. DHEC-OCRM, as steward of the State's coastal resources, is responsible for implementing this policy. The implementation is derived from a baseline established by DHEC-OCRM which runs parallel to the shoreline on oceanfront beaches. The baseline is evaluated and redrawn by DHEC-OCRM every eight to ten years and, as directed by the Beachfront Management Act, stretches of beach are divided into standard erosion zones and inlet erosion zones based on their physical characteristics and proximity to inlets.

The baseline for a standard erosion zone is established at the location of the crest of the primary oceanfront sand dune in that zone. If the shoreline in a standard erosion zone had previously been altered naturally or artificially by the construction of erosion control or other anthropogenic structures, the baseline is established where the crest of the dunes would be had the disturbance not occurred..

The baseline for inlet erosion zones is determined differently for inlets that are stabilized by jetties, groins, or other structures, and inlets that are not stabilized. For unstabilized inlets, DHEC-OCRM establishes the baseline at the most landward point of erosion at any time during the past 40 years. For inlet zones that are stabilized by jetties, groins, or

other structures, DHEC-OCRM establishes the baseline at the location of the crest of the dune, and not at the location where the dunes would be had the inlet remained unstabilized.

The second part of implementing the retreat policy at the State level is the setback line. The setback line is a boundary established by DHEC-OCRM that is landward of the established baseline at a distance equal to 40 times the average erosion rate, and not less than 20 feet landward of the baseline.

No new construction is permitted seaward of the baseline, with the exception of wooden walkways not more than six feet wide, wooden decks no larger than 144 square feet, public fishing piers, golf courses, normal landscaping, pools that were located landward of existing functioning erosion control structures, groins, or structures permitted by a DHEC-OCRM special permit. A DHEC-OCRM permit is required for all of the above actions except for the construction of wooden walkways not more than six feet wide.

Construction within the State setback area is regulated in order to implement the State retreat policy. Construction, reconstruction, or alterations between the State baseline and setback line are governed as habitable structures; erosion control devices; and swimming pools. All other construction between the baseline and setback line requires a permit from DHEC-OCRM. New habitable structures built partially or wholly within the setback area may not exceed 5,000 square feet of heated space, must be located as far landward on the property as possible, and may not incorporate any erosion control structure or device as an integral part the structure. No part of the building may be constructed seaward of the baseline or on the primary sand dune. The applicant must certify to DHEC-OCRM in writing that these conditions are accurate, and submit a drawing that shows the footprint of the structure on the property, a cross section of the structure, and the structure's relation to property lines and setback lines which may be in effect.

Owners may replace habitable structures permitted within the setback that have been destroyed beyond repair by natural causes after notifying DHEC-OCRM. The owner must certify that the total square footage of the replaced structure seaward of the setback line is not greater than the original square footage beyond the setback line, the replaced structure is no further seaward than the original structure, and is constructed as far landward as possible, considering local zoning and parking requirements.

No new erosion control devices are allowed seaward of the setback line except to protect a public highway that existed prior to the enactment of the Beachfront Management Act. Erosion control structures may not be repaired or replaced if destroyed more than 50 percent above grade on a parcel-by-parcel basis. DHEC-OCRM is responsible for assessing the damage to erosion control devices and structures, as well as habitable structures, to determine the extent of damage following hurricanes or other events.

Finally, no new pools are permitted to be constructed seaward of the setback line, unless they are located as landward as possible of an existing, functional erosion control device. Pools that existed prior to 1988 may be repaired or replaced, if destroyed beyond repair, if the owner certifies in writing to DHEC-OCRM that it is moved as far landward as practical, is rebuilt no larger than the destroyed pool, and is constructed in such a manner that cannot become or act as an erosion control device.

DHEC-OCRM may issue a special permit for all other construction or alteration between the setback line and baseline or seaward of the baseline.

The baseline and setback line for Myrtle Beach can be found online:
http://www.dhec.sc.gov/environment/ocrm/beachfront_jurisdiction.htm

4.3 City of Myrtle Beach Authorities

The Beach Advisory Committee meets on an as needed basis to study issues of particular significance to the preservation and development of the beach. The Committee submits a report to City Council in March of each year and advises Council on the activities of the committee and recommendations for any action to be taken by City Council.

The Planning Commission is established and governed by the provisions of *Chapter 15* of the *City of Myrtle Beach Code of Ordinances* and of *SC Code Title 6, Chapter 29*. This nine member commission meets bi-monthly and is responsible for planning for the physical, social and economic growth, development and redevelopment of the area within its authority. Under the Local Government Comprehensive Planning Enabling Act of 1994 the Commission is responsible for development of the City's Comprehensive Plan.

If an event (such as when local emergency orders will be authorized during an erosion emergency) occurs such that City staff feels that some emergency protection needs to be provided to any structure (deck, building, parking, etc.) or the general public may be at peril during beach use, an emergency order will be issued by the City Manager that would cause City staff to apply for an emergency order from the OCRM to remediate the problem through either sand scraping, sand hauling, sand bagging, or some other means to correct the problem on a short term basis.

4.3.1 City of Myrtle Beach Comprehensive Plan

The 2011 City of Myrtle Beach Comprehensive Plan contains 12 elements and most specifically addresses some aspect of beach management planning.

The goal of the Economic Development Element is to become a sustainable community with economic development concentrating on increasing and diversifying the area's economic base and strengthening existing businesses. Objectives and strategies include strengthening and growing the travel and tourism industry while diversifying the tourism market.

The goal of the Tourism Element is to retain the economic and social advantages of tourism development while reducing or mitigating any undesirable impacts on the natural, historic, cultural, or social environment. This is achieved by balancing the needs of the tourists with those of the local community. Objectives and strategies include continuing to provide public facilities such as beach access with restrooms, showers, trash and recycling receptacles, parking, ADA complaints ramps, water fountains, etc. The element also addresses the need to continue to develop a comprehensive recovery plan for man-made or natural disasters.

The Natural Resources Element's goal is to integrate the natural and developed environments creating a sustainable urban habitat with clean air and water, habitat for fish and wildlife, and comfortable and secure places for people to live, work, play and raise a family. The objectives and strategies of the element include:

- Continuing to work with Horry County in respecting and rehabilitating the natural environment and fostering its enjoyment by the public with consistent regulation and enforcement,
- Continuing to manage use of the beach so that it remains a preeminent recreational beach that is a major contributor to the tourist economy and the quality of life of residents,
- Continuing to protect remnant dunes and their vegetation, continuing to maintain water quality monitoring of inland waters and the ocean that meets or exceeds Federal and State standards and publicize the results,
- Continuing to ensure that spaces designated as parks and open space are permanently protected as such, and
- Developing a wayfinding system that can be used at the beach access points to help visitors and especially children remember their location.

The goal of the Neighborhoods Element is to become a sustainable community with neighborhoods being protected, preserved, safe, secure, and aesthetically pleasing with well-maintained supporting facilities and convenient connections to nearby supporting land uses. The objectives and strategies include enforcing leash, animal waste, and litter laws on the beach; providing adequate parking for residents and visitors; developing a pedestrian network while updating the sidewalk master plan to include handicapped accessible sidewalks from houses to the beach; providing recycling and trash containers for residents and visitors in public areas; examining ways to make parks more user-friendly; and improving the appearance of portable toilets at beach access points.

The goal of the Land Use Element is to balance the socio-economic needs of residents, business owners and visitors while creating an environment where all can live, work, and play. The element recognizes that we live in an active tourism community and in a coastal area that will be heavily impacted by rising sea levels associated with global climate change. The objectives of the element include preserving open space, natural beauty, and critical environmental areas while improving our communities' quality of life and guiding new growth.

The Priority Investment Element encourages more long-term thinking and planning about capital improvements and public facility needs, how to finance them, and greater intergovernmental coordination and planning of these projects. The element contains a wish list of capital improvement projects over a 10 year planning period and includes acquiring more land near the oceanfront to provide more parks; undertaking a beach density study to determine the needs for beach access, parks and parking; dune walkover renovations and replacement; improving appearance of portable toilets at beach access points; creating a wayfinding system at beach access points; providing public transit lanes on Ocean Blvd.;

undergrounding utilities on Ocean Blvd.; eliminating stormwater runoff and pipes on the beach; and building more ocean outfalls.

4.3.2. City of Myrtle Beach Floodplain Management and Hazard Mitigation Plan

The purpose of the *2011 City of Myrtle Beach Floodplain Management and Hazard Mitigation Plan* is to:

- Provide a comprehensive update to the *City of Myrtle Beach Floodplain Management and Hazard Mitigation Plan*, as amended in 2004.
- Protect life, safety and property by reducing the potential for future damages and economic losses that result from hazards;
- Make the community a safer place to live, work and play;
- Qualify the City of Myrtle Beach for grant funding in both the pre-disaster and post-disaster environments;
- Speed recovery and redevelopment following future disaster events;
- Demonstrate a firm local commitment to hazard mitigation principles;
- Maintain compliance with State and Federal legislative requirements for local hazard mitigation plans; and
- Meet the requirements of the Community Rating System (CRS) program.

4.3.2.1 Supporting documents associated with the Floodplain Management and *Hazard Mitigation Plan*

Zoning Ordinance: Zoning represents the primary means by which land use is controlled by local governments. As part of a community's police power, zoning is used to protect the public health, safety and welfare of those in a given jurisdiction that maintains zoning authority. A zoning ordinance is the mechanism through which zoning is typically implemented. Since zoning regulations enable municipal governments to limit the type and density of development, a zoning ordinance can serve as a powerful tool when applied in identified hazard areas.

Myrtle Beach adopted a *Zoning Ordinance* in 1947, which is included as Appendix A of the *Code of Ordinances*, to regulate new development and to guide local decisions for residential, commercial and industrial growth within the City limits. Unwise development in hazardous areas is prohibited or discouraged through floodplain management regulations and a coastal protection overlay district.

Subdivision Ordinance: A subdivision ordinance is intended to regulate the development of housing, commercial, industrial or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Subdivision design that accounts for natural hazards can dramatically reduce the exposure of future development.

The subdivision ordinance is included as Chapter 20 of the *Code of Ordinances*. The subdivision ordinance accounts for natural hazards by prohibiting the platting of land subject to flooding for residential uses and requiring base flood elevations for subdivisions of greater than 50 lots or 5 acres.

Comprehensive Plan: A comprehensive land use plan establishes the overall vision for what a community wants to be and serves as a guide to future governmental decision making. Given the broad nature of the plan and the integration of hazard mitigation measures into the comprehensive plan can enhance the likelihood of achieving risk reduction goals, objectives and actions.

The City of Myrtle Beach adopted its first *Comprehensive Plan* in April 1970 to serve as a guidebook for the city's development, improvement, and growth over a 20-year period. The Plan, amended many times over the years, was rewritten in February 2011 and addresses population, economic development, tourism, natural resources, cultural resources, transportation, land use, neighborhoods, housing, community facilities, priority investment, and implementation.

Stormwater Management Plan: A stormwater management plan is designed to address flooding associated with stormwater runoff. The stormwater management plan is typically focused on design and construction measures that are intended to reduce the impact of more frequently occurring minor urban flooding.

The City of Myrtle Beach Stormwater Management Plan can be found in Chapter 18 of the *Code of Ordinances*. The Public Works Department, with assistance from Code Enforcement implements the City's Stormwater Management Plan.

Building Codes, Permitting and Inspections: Building Codes regulate construction standards. In many communities, permits and inspections are required for new construction. Decisions regarding the adoption of building codes (that account for hazard risk), the type of permitting process required both before and after a disaster, and the enforcement of inspection protocols all affect the level of hazard risk faced by a community.

Myrtle Beach has adopted and enforces the 2003 version of the *International Building Code*.

4.3.3. Disaster Preparedness and Evacuation Plan

The *City of Myrtle Beach Basic Disaster Plan* establishes a framework through which the City may prevent or mitigate the impacts of, prepare for, respond to, and recover from, a wide variety of disasters that could adversely affect the health, safety or general welfare of the citizens and visitors of Myrtle Beach. This plan outlines and utilizes FEMA's Incident Command System (ICS) that includes a coordinated (multi-department and multi-agency) response to incidents beyond the scope of normal city operations.

The *Plan*:

- describes the various types of emergencies and disasters that may occur; and provides procedures for disseminating warning and for determining, assessing, and reporting the severity and magnitude of disasters.
- establishes the concepts under which local government will operate during emergencies by defining the emergency role and function of City Government and defining the responsibilities of City Government officials.
- creates a framework for expeditious, effective and coordinated deployment of available resources.
- identifies functional responsibilities and actions required of City Government to obtain and implement assistance and relief on a State and Federal level, and those actions to be taken in the identification, organization, and mobilization of resources necessary to assist the City before, during and after an emergency.
- outlines the forms of recovery assistance available to individuals, businesses and governments.
- creates a framework to promote pre and post disaster hazard mitigation efforts..

The City has developed and will continue to update its emergency plans and possesses the capability to execute such plans. Prediction and warning systems have been established which make it possible to anticipate some disaster situations that may affect the City.

The City has entered into mutual-aid agreements with other local governments, special districts and private organizations to assist during emergency operations with procedures in place involving clean-up operations immediately after a storm. The City has entered into an agreement with a private company to provide debris management and disaster recovery technical assistance. The agreement involves debris removal and will include emergency road clearance, public rights-of-way clearance, demolition of structures, private property (right-of-entry program) clearance, publicly owned property clearance, hazard stumps (removal, back-fill and haul), temporary debris staging and reduction sites (TDSRS), TDSRS site reclamation, disaster event generated hazardous waste abatement, sand screening, and debris and white goods disposal. A temporary disposal site located off of Mr. Joe White Avenue has been identified. The City and other appropriate agencies will determine the priority of work areas, working hours, documentation, and inspection.

The City's re-entry plan for disaster response and recovery covers the beach area, but it is not a separate entity with separate rules. City staff would assess the condition of the beachfront and make decisions on accessibility but it would be by area as conditions warrant and the need for improvements by priority. Security (to include restricted access and denial of access) would be handled by the Police Department, National Guard, DNR, and SLED (SC Law Enforcement Division).

The City's Public Works Department maintains a contact and notification system with DHEC-OCRM.

During disaster emergencies it is the policy of the City's designated emergency management administration team to support the inspection teams as required and the general public with zoning, building code, and permitting assistance. In order to ease the impact upon permanent residents, during the first 60 days after a storm, no permit fees are charged by the Department of Construction Services for residential storm damage repair permits. Commercial storm damage permits can be purchased at established fee rates. All permit applications in process but not yet permitted are put on hold up to eight weeks depending on storm damage and resource availability. Only permits relating to storm damage will be accepted. Any permit for new non-storm related projects will be put on hold up to eight weeks depending on work load of City staff.

The State possesses expertise and resources including specific plans and procedures that may be utilized in relieving emergency or disaster related problems that are beyond the capacity of the City. Should City and State resources prove inadequate to cope with disaster demands; the Governor will request Federal assistance under a Presidential Declaration.

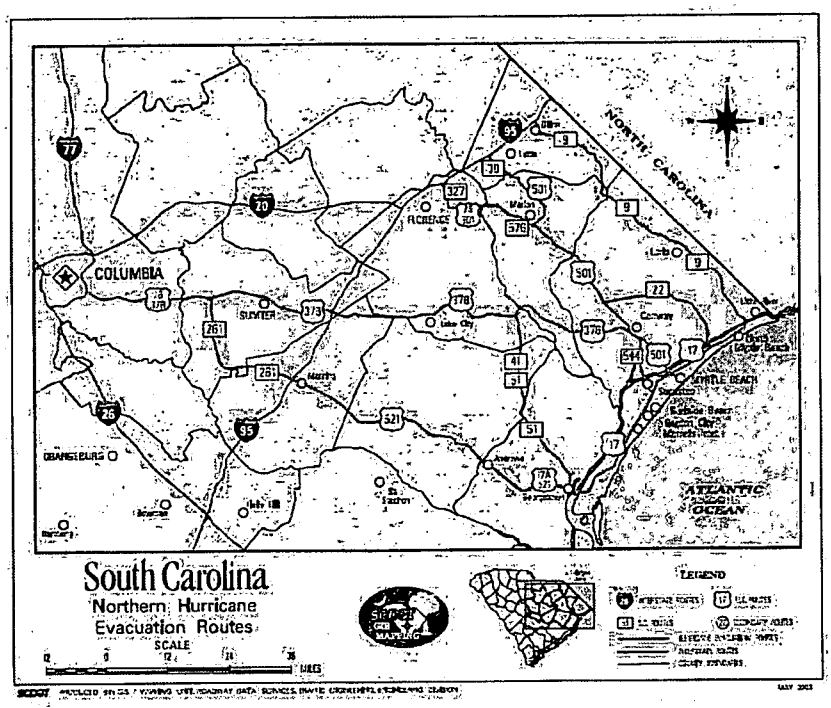
Myrtle Beach has been certified by NOAA's National Weather Service as a Tsunami Ready ™ and Storm Ready site.

Evacuation Routes for the Grand Strand Area

To be prepared in the event of a disaster and evacuation declaration the state of SC has identified the following evacuation routes for the Myrtle Beach area.

If a person lives or works...

- from Myrtle Beach International Airport south to Surfside Beach, use SC Highway 544.
- from Myrtle Beach International Airport north to Mr. Joe White Ave, use US Highway 501.
- from Mr. Joe White Ave N to Briarcliffe Acres, use US Highway 22 (Veterans Highway).
- from Briarcliffe Acres to Little River, use SC Highway 9.



5.0 Erosion Control and Management

5.1. Shoreline Change Analysis

The Beachfront Management Act defines three types of shoreline zones. A standard erosion zone is a segment of shoreline which is not directly influenced by an inlet or associated shoals. An unstabilized inlet erosion zone is a segment of shoreline along or adjacent to a tidal inlet which is directly influenced by an inlet and its associated shoals and which is not stabilized by jetties, terminal groins, or other structures. A stabilized inlet erosion zone is a segment of shoreline along or adjacent to a tidal inlet which is directly influenced by the inlet and its associated shoals and which is stabilized by jetties, terminal groins, or other structures.

All of Myrtle Beach is classified as a standard erosion zone.

5.1.1. Beach Profiles

Representative beach profiles measured from fixed starting points provide the best means of quantifying short-term beach changes. These data trace the elevation of the ground along an imaginary straight line from the dune (or some other starting point) past the water level to a point beyond mean low water and allow for changes in beach width (in feet) and beach volume (expressed in cubic yards per foot of shore length) to be assessed. Profiles have been measured in Myrtle Beach since mid-1955.

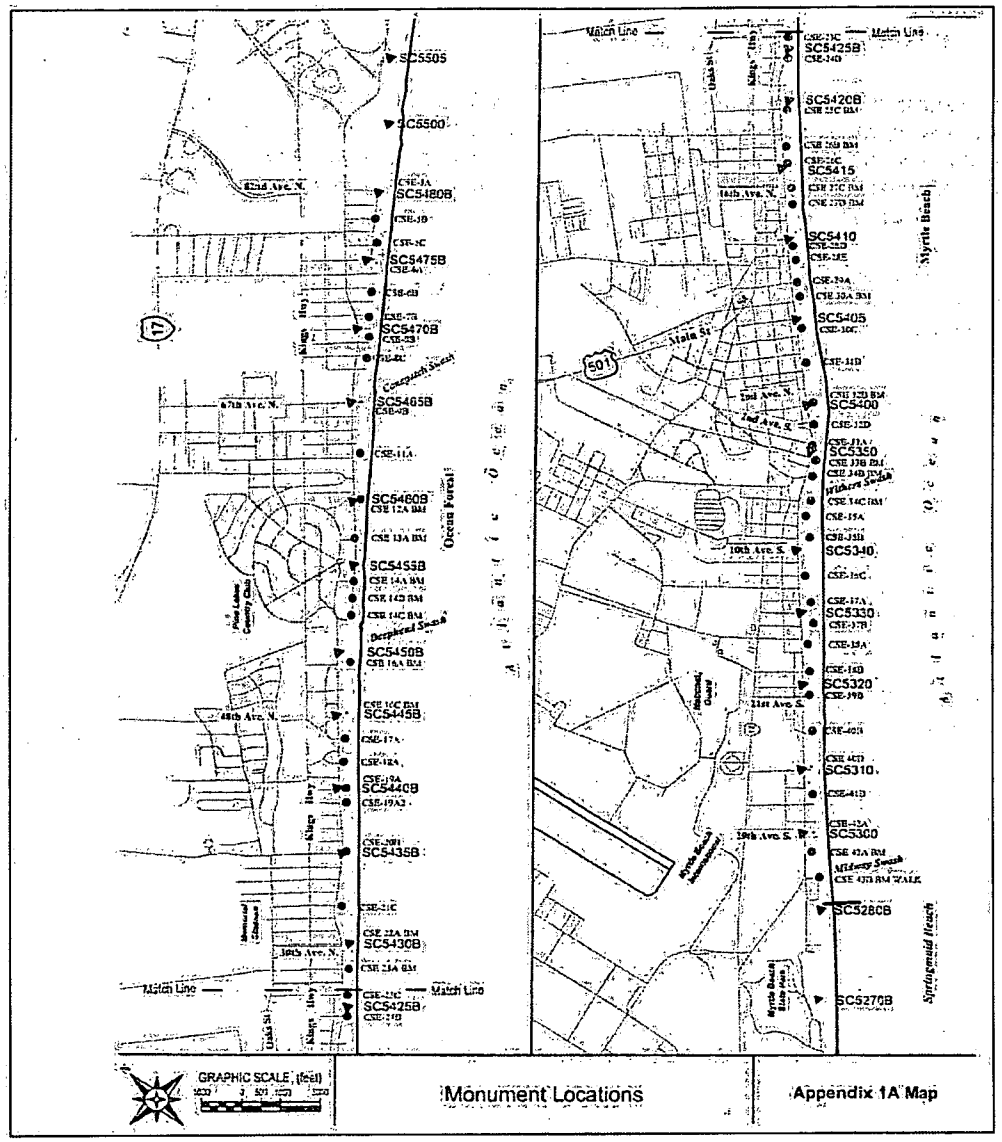
Twenty-five permanent beach profile monuments, beginning with station 5300 at 29th Avenue and ending at station 5505 at Club Drive, have been installed by DHEC-OCRM. These monuments have been surveyed routinely between 1987 and the present and provide the best city-wide basis for monitoring beach changes (see Figure 5.1.1 below for monument locations).

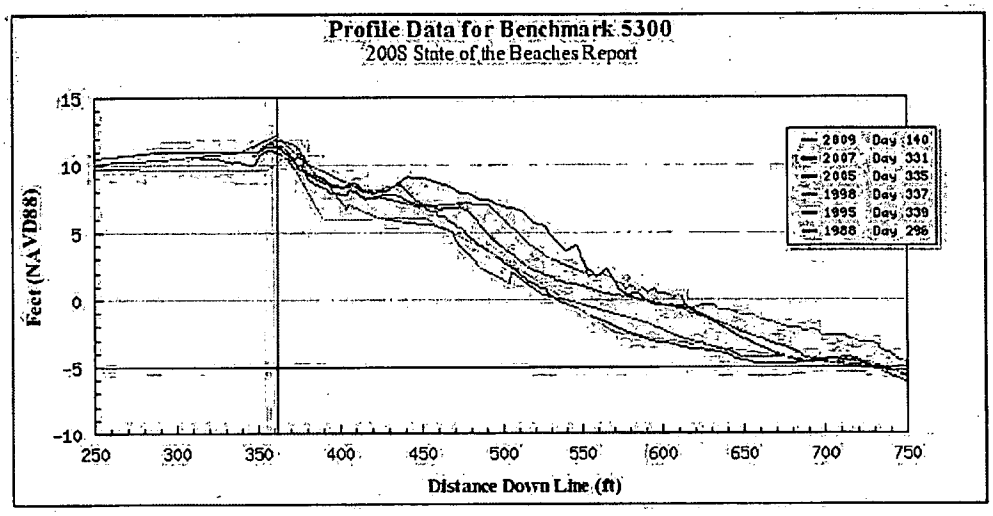
The figures below show the beach profile changes between 1988 and 2009 at stations 5300, 5340, 5350, 5450, 5464 and 5480. Information on other monuments is available at http://gis.coastal.edu.

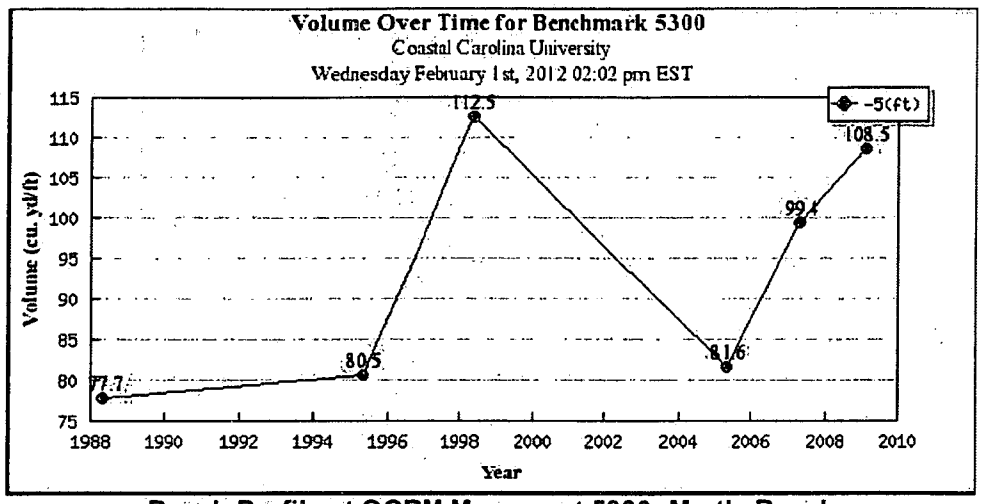
The "0" position on the x-axis of the profile figures marks the location of the beach profile monuments whereas the vertical red line marks the location of the DHEC-OCRM baseline. The figures and tables show the volumes of sand that were measured above the -5 ft contour (NAVD88) and seaward of the DHEC-OCRM baseline for the years 1988, 1990, 1993, 1995, 1998, 2000, 2005, 2006, 2007 and 2009.

It is important to note that the beach profile volume changes presented in this section are based on data from 1988 to 2009 whereas the shoreline change rates in Section 5.1.2 are based on historical shoreline positions from 1872 to 2006. The beach profiles show recent, annual changes whereas the long-term shoreline change rates show the annual erosion or accretion that has occurred since 1872.

A map, developed by Coastal Science Engineering for the *Monitoring and Analyses of the 1997 Myrtle Beach – Reach 2 Shore Protection Project 2009 Beach Monitoring*, indicating all beach monitoring stations and numbers is provided below.


SC5505
SC5500
SC5480B
SC5475B
SC5470B
SC5465B
SC5460B
SC5455B
SC5450B
SC5445B
SC5440B
SC5435B
SC5430B
SC5425B
SC5420B
SC5415
SC5410
SC5405
SC5400
SC5350
SC5340
SC5330
SC5320
SC5310
SC5300
SC5280B
SC5270B
Match Line
GRAPHIC SCALE (feet)
Monument Locations
Appendix 1A Map


Profile Data for Benchmark 5300
2008 State of the Beaches Report
Feet (NAVD88)
Distance Down Line (ft)
2009 Day 140
2007 Day 331
2005 Day 335
1998 Day 337
1995 Day 339
1988 Day 296

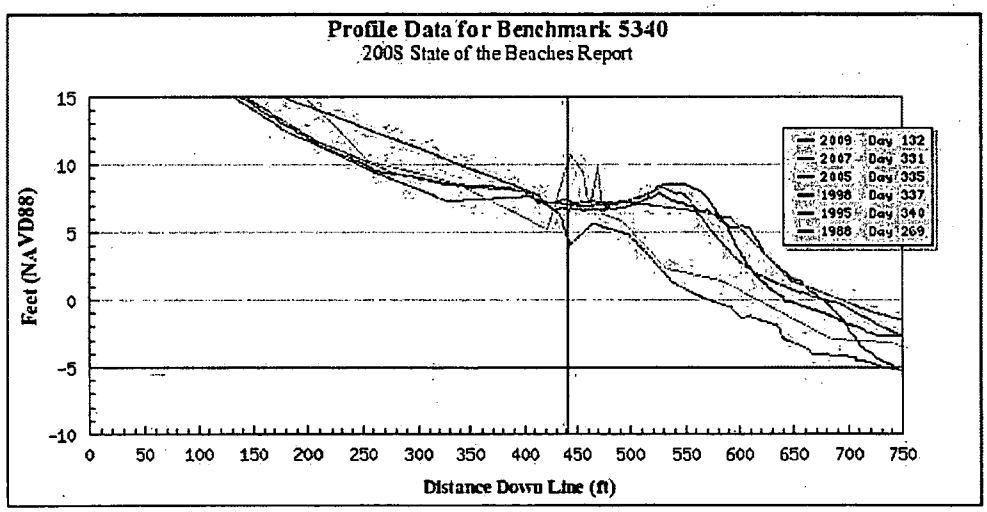


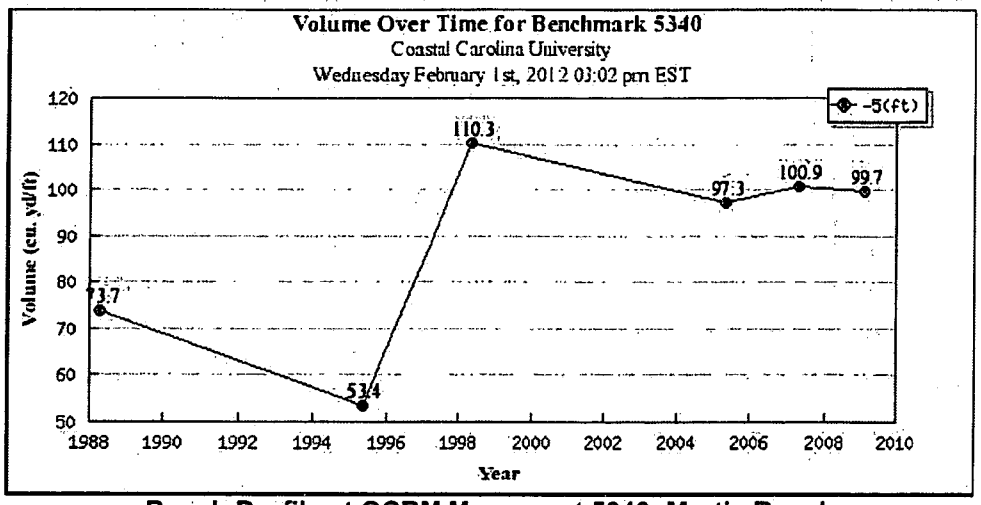
Beach Profile at OCRM Monument 5300: Myrtle Beach

Survery Date	Profile Volume (yd^3/ft)	Volume Change from Previous Profile (yd^3/ft)
January 2009	108.50	9.1
November 2007	99.43	17.8
November 2005	81.60	-30.9
December 1998	112.50	32.0
December 1995	80.55	2.8
October 1988	77.71	

All profile volumes calculated seaward of the OCRM baseline, above the -5 ft contour.

Monument 5300:
At monument 5300, the average beach profile volume is 93 yd^3/ft, but the volume at this station has varied from 113 yd^3/ft to 78 yd^3/ft. From October 1988 to January 2009, this station gained about 30 yd^3/ft of sand. The most recent measurements, between November 2008 and November 2009, indicate that this profile gained about 9.1 yd^3/ft of sand during this time.





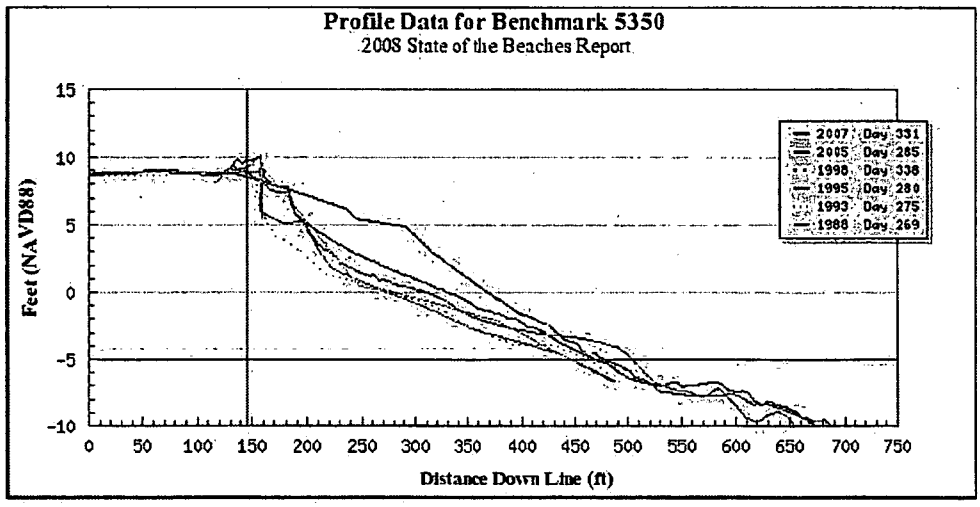
Beach Profile at OCRM Monument 5340: Myrtle Beach

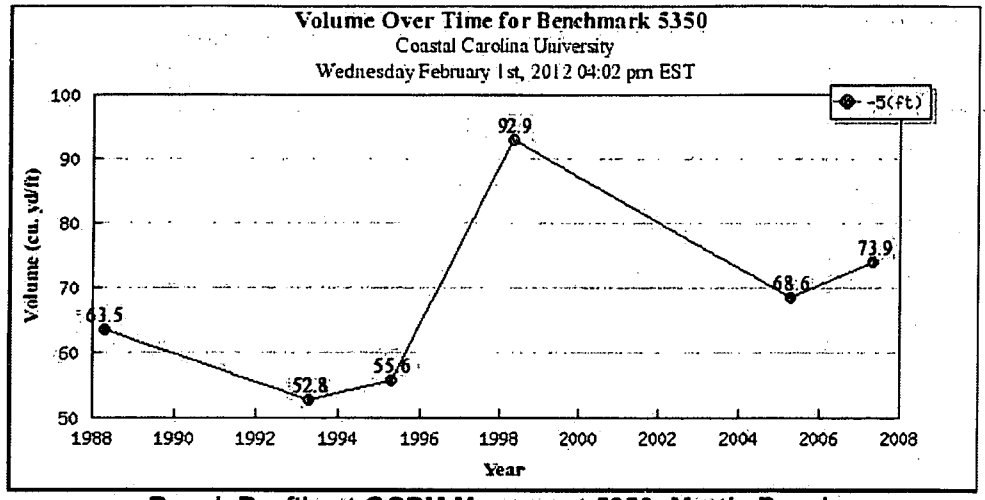
Survery Date	Profile Volume (yd^3/ft)	Volume Change from Previous Profile (yd^3/ft)
May 2009	99.66	-1.2
November 2007	100.86	3.5
November 2005	97.34	-12.9
December 1998	110.27	56.9
February 1995	53.37	-20.3
September 1988	73.66	

All profile volumes calculated seaward of the OCRM baseline, above the -5 ft contour.

Monument 5340:

At monument 5340, the average beach profile volume is 89 yd^3/ft, but the volume at this station has varied from 110 yd^3/ft to 53 yd^3/ft. From September 1988 to May 2009, this station gained about 26 yd^3/ft of sand. The most recent measurements, between November 2007 and May 2009, indicate that this profile lost about 1.2 yd^3/ft of sand during this time.



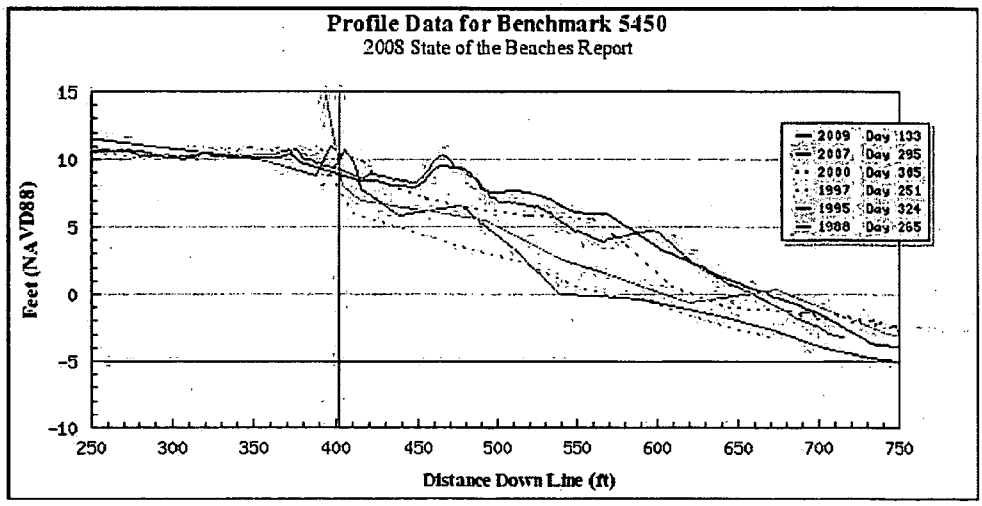


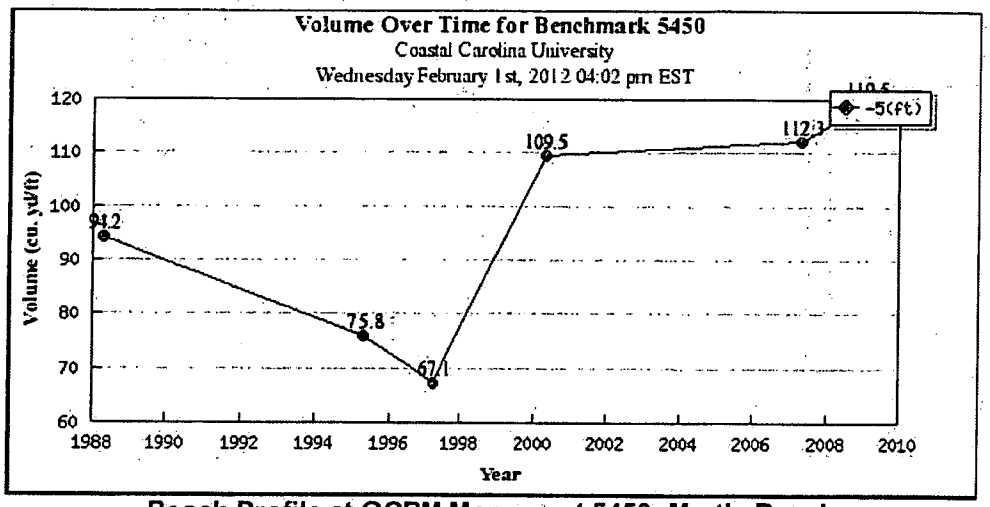
Beach Profile at OCRM Monument 5350: Myrtle Beach

Survery Date	Profile Volume (yd^3/ft)	Volume Change from Previous Profile (yd^3/ft)
November 2007	73.94	5.38
October 2005	68.56	-24.35
December 1998	92.91	37.28
January 1995	55.63	2.87
October 1993	52.76	-10.77
September 1988	63.54	

All profile volumes calculated seaward of the OCRM baseline, above the -5 ft contour.

Monument 5350:
At monument 5350, the average beach profile volume is 68 yd^3/ft, but the volume at this station has varied from 53 yd^3/ft to 93 yd^3/ft. From September 1988 to November 2007, this station gained about 10 yd^3/ft of sand. The most recent measurements, between October 2005 and November 2007, indicate that this profile gained about 5.4 yd^3/ft of sand during this time.



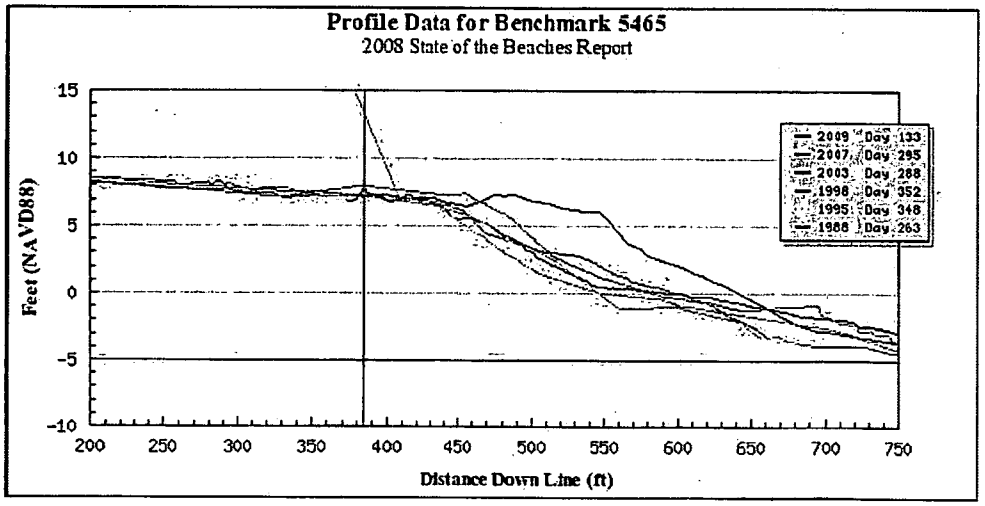


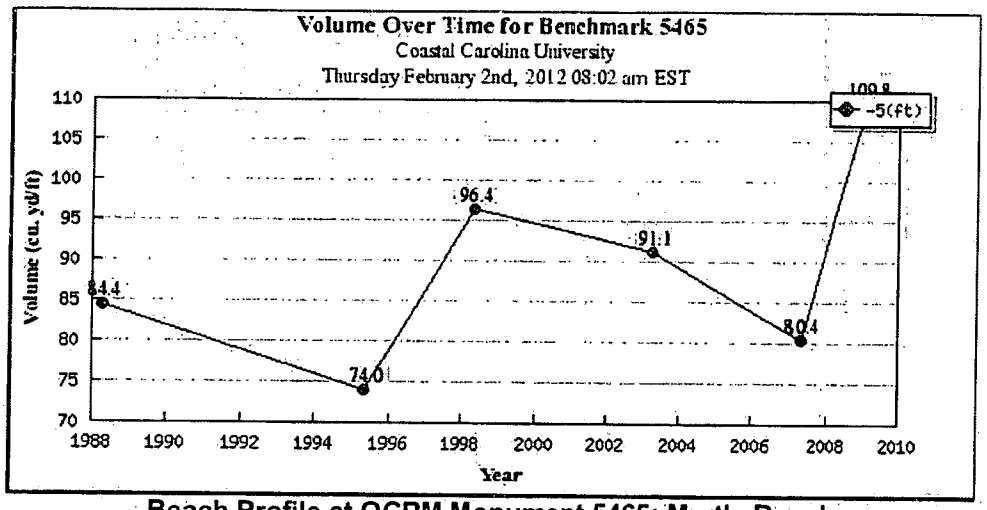
Beach Profile at OCRM Monument 5450: Myrtle Beach

Survery Date	Profile Volume (yd^3/ft)	Volume Change from Previous Profile (yd^3/ft)
May 2009	119.48	7.2
October 2007	112.30	2.8
October 2000	109.49	42.4
September 1997	67.10	-8.7
November 1995	75.76	-18.4
September 1988	94.20	

All profile volumes calculated seaward of the OCRM baseline, above the -5 ft contour.

Monument 5450:
At monument 5450, the average beach profile volume is 96 yd^3/ft, but the volume at this station has varied from 67 yd^3/ft to 120 yd^3/ft. From September 1988 to May 2009, this station gained about 25 yd^3/ft of sand. The most recent measurements, between October 2007 and May 2009, indicate that this profile gained about 7 yd^3/ft of sand during this time.



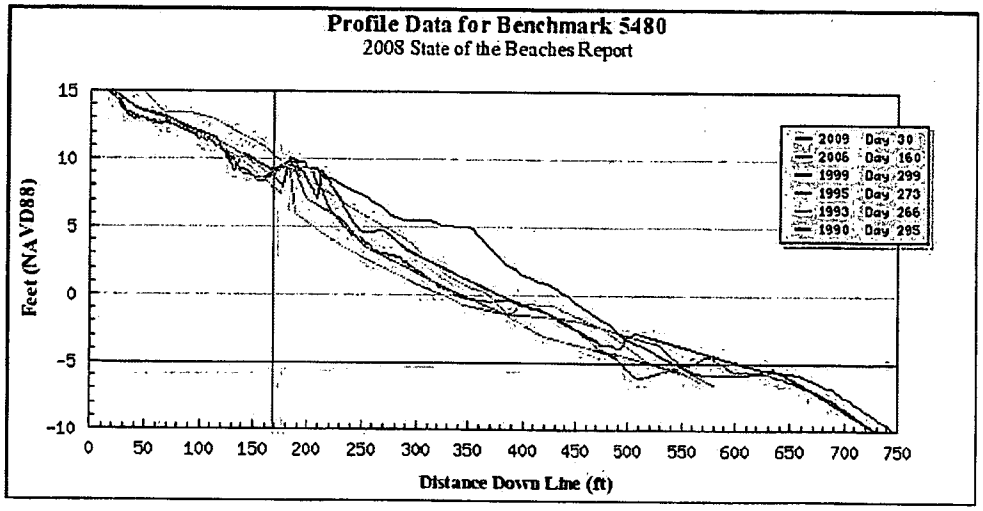


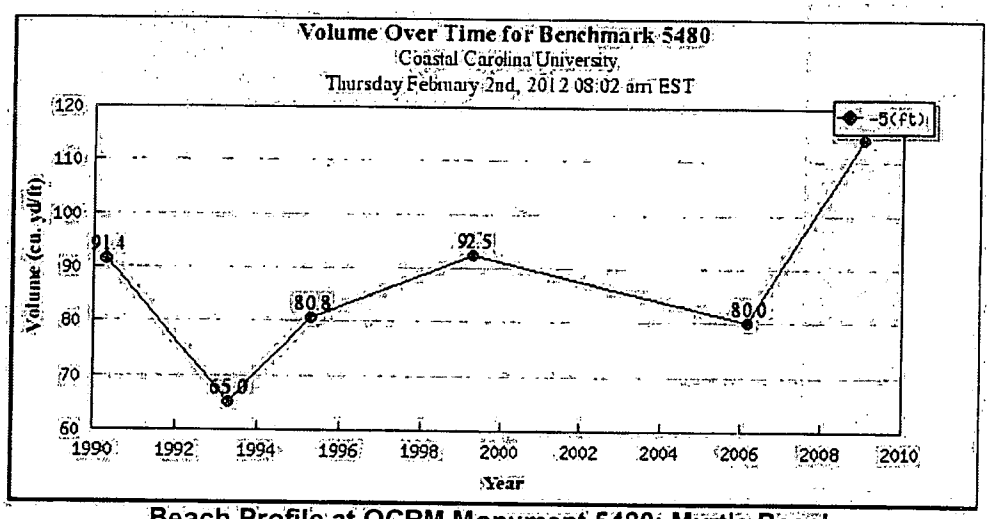
Beach Profile at OCRM Monument 5465: Myrtle Beach

Survery Date	Profile Volume (yd^3/ft)	Volume Change from Previous Profile (yd^3/ft)
May 2009	109.78	29.4
October 2007	80.39	-10.7
October 2003	91.14	-5.3
December 1998	96.39	22.4
December 1995	73.98	-10.4
September 1988	84.38	

All profile volumes calculated seaward of the OCRM baseline, above the -5 ft contour.

Monument 5465:
At monument 5465, the average beach profile volume is 91 yd^3/ft, but the volume at this station has varied from 74 yd^3/ft to 110 yd^3/ft. From September 1988 to May 2009, this station gained about 25 yd^3/ft of sand. The most recent measurements, between October 2007 and May 2009, indicate that this profile gained about 29 yd^3/ft of sand during this time.





Beach Profile at OCRM Monument 5480: Myrtle Beach

Survery Date	Profile Volume (yd^3/ft)	Volume Change from Previous Profile (yd^3/ft)
January 2009	114.35	34.3
January 2006	80.05	-12.4
September 1999	92.46	11.6
September 1995	80.82	15.8
September 1993	65.00	-26.4
October 1990	91.40	

All profile volumes calculated seaward of the OCRM baseline, above the -5 ft contour.

Monument 5480:
At monument 5480, the average beach profile volume is 87 yd^3/ft, but the volume at this station has varied from 65 yd^3/ft to 114 yd^3/ft. From October 1990 to January 2009, this station gained about 23 yd^3/ft of sand. The most recent measurements, between January 2006 and January 2009, indicate that this profile gained about 34 yd^3/ft of sand during this time.

In 1988, the SC Coastal Council (OCRM) began a program of semi-annual measurements along 23 stations within Myrtle Beach. In addition, the City during this same period began detailed surveys of the beach profile at 60 locations as part of the monitoring of the beach renourishment efforts. These studies were performed by Coastal Science and Engineering, Inc. (CSE). Profiles have been continuously updated since 1988 until present. Each spring in the May/June period CSE, in contract with the City of Myrtle Beach as part of the *Renourishment Project Cooperative Agreement* with the US Army Corps of Engineers (USACOE), provides a complete profile representative of the entire Myrtle Beach incorporated beachfront area. In 2009, CSE ran profiles at 71 monitoring stations.

A comparison of the profiles taken over this period of time helps to provide an understanding of erosion trends. They also suggest the effectiveness of renourishment. In addition, profiles show the variable nature of the city's beach from point to point along its length. Ultimately, the profiles indicate how dynamic and complex is the interaction of wave and sand. A copy of the beach monitoring report is sent annually to the OCRM and US Army Corps of Engineers.

With the advent of annual profile monitoring by the CSE in 1985, OCRM in 1988, and the USACOE in 1997, a much more detailed history has emerged with the annual sand budget for Myrtle Beach. As opposed to actual measurements of beach retreat in feet, a calculated actual sand loss is much more representative of beach processes since renourishment greatly affects the amount of actual beach lost to erosion. From the renourishment project completed in 1997 until the interim project in 2008, Reach 2 lost an average of about 1.2 cubic yards per foot of beach per year. This number is approximately 40 percent lower than the decadal loss noted by CSE following the 1985-1987 renourishment project.

Additional information on the survey stations, survey date and volume of sand recorded can be found in Coastal Science and Engineering's *Monitoring and Analyses of the 1997 Myrtle Beach – Reach 2 Shore Protection Project 2009 Beach Monitoring* report.

5.1.2 Long-Term Erosion Rates and Shoreline Change

The erosion rates at all DHEC-OCRM beach monitoring stations statewide have been recalculated using the best available historical shoreline data. In most cases, the best available data included historical shoreline positions from as early as the 1850s. These older shoreline positions have also been used by the Federal government to analyze shoreline change, and are considered to be accurate. The long-term erosion or accretion rate at each station was calculated by using a least-squares best fit regression through all data points. The resulting erosion rates are the official long-term rates used by DHEC-OCRM to update the beachfront setback line position. A variety of factors can cause short-term rates of change to be significantly different from the long-term erosion rates, but the setback line is based on a long-term trend.

CSE calculated the erosion rates from Myrtle Beach using historical shoreline change maps.. Those interim erosion rates were officially adopted by the OCRM in 1988. The calculated erosion rates, 0.68 feet per year for the entire length of Myrtle Beach, are very low when compared with rates elsewhere along the SC coast. The erosion rates during this period are close to the rates calculated by research Planning Institute, Inc. in 1984. Those preliminary calculations indicated an annual erosion rate of 0.63 feet per year attributed to the rise in sea level, with little erosion resulting from longshore transport.

Myrtle Beach is a relatively stable area. Long-term hydrographic and aerial photographic surveys between 1878 and 1940 indicate distinct erosional trends along the southern end of the beach. On the northern end, however, net change was zero to moderately accretional. Between 1940 and 1985, the Myrtle Beach area experienced approximately 0.66 feet per year of erosion. There was no appreciable difference in long-term erosion rates between the more natural northern portion of Myrtle Beach as compared to the highly developed central and southern regions. In 1985, Myrtle Beach began a renourishment project. Following renourishment, erosion rates changed only slightly to approximately 0.4 feet per year. Currently, the entire area is slightly erosional.

In general, most of Myrtle Beach is reasonably stable over the long-term. The beachfront of Myrtle Beach is broken in five places by inlets: Midway Swash at the city's southern boundary, Withers Swash at 4th Avenue South, Deephead Swash at 54th Avenue North (piped between Ocean Boulevard and the beachfront), Canepatch Swash at 68th Avenue North (also piped for the last block before the ocean), and Bear Branch Creek north of 82nd Avenue North. A sixth inlet, Singleton Swash, is approximately 600 feet north of the city's northern boundary. Even though these tidally influenced inlets drain much of the city, they are not large enough to form shoals or spits which migrate. Therefore, no special considerations for erosion at the swashes need be made.

The calculated long-term erosion rates for Myrtle Beach are shown in the table below. The official average long-term erosion rate is -0.59ft/yr for Myrtle Beach. However, localized long-term erosion rates may be as high as -1.21 ft/yr.

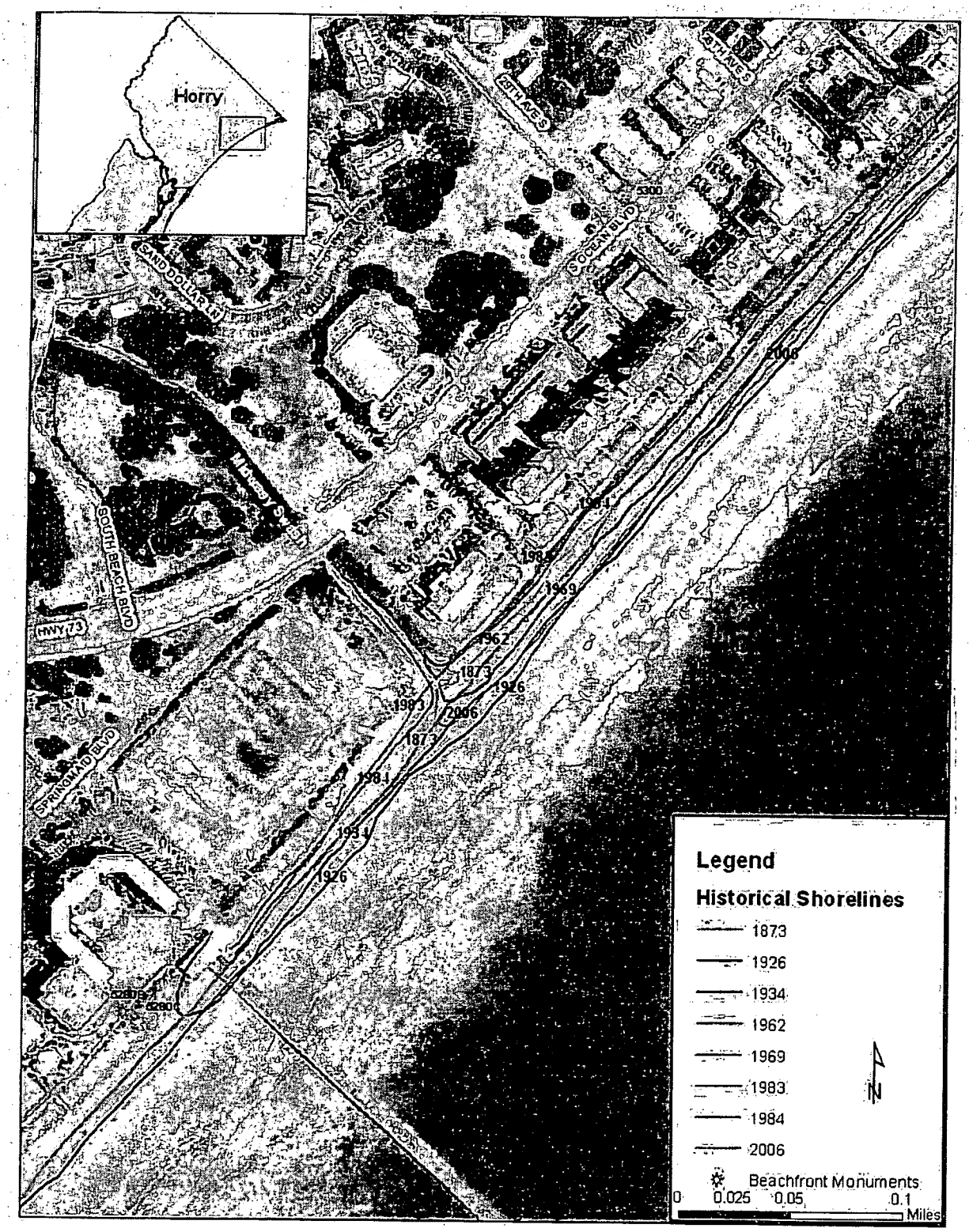
The erosion rate between Midway Swash and Withers Swash is moderately erosional averaging -0.61 ft/yr. The section from Withers Swash to Deephead, average erosion rate is -0.70 ft/yr. The section between Deephead Swash to Canepatch Swash experienced similar changes in profile with an average erosion rate is -0.59 ft/yr. In the section of beach from Canepatch Swash to Bear Branch Creek, the average erosion rate is -0.22 ft/yr. The northernmost section of beach, from Bear Branch Creek to the city's northern boundary, average erosion rate is -0.40 ft/yr.

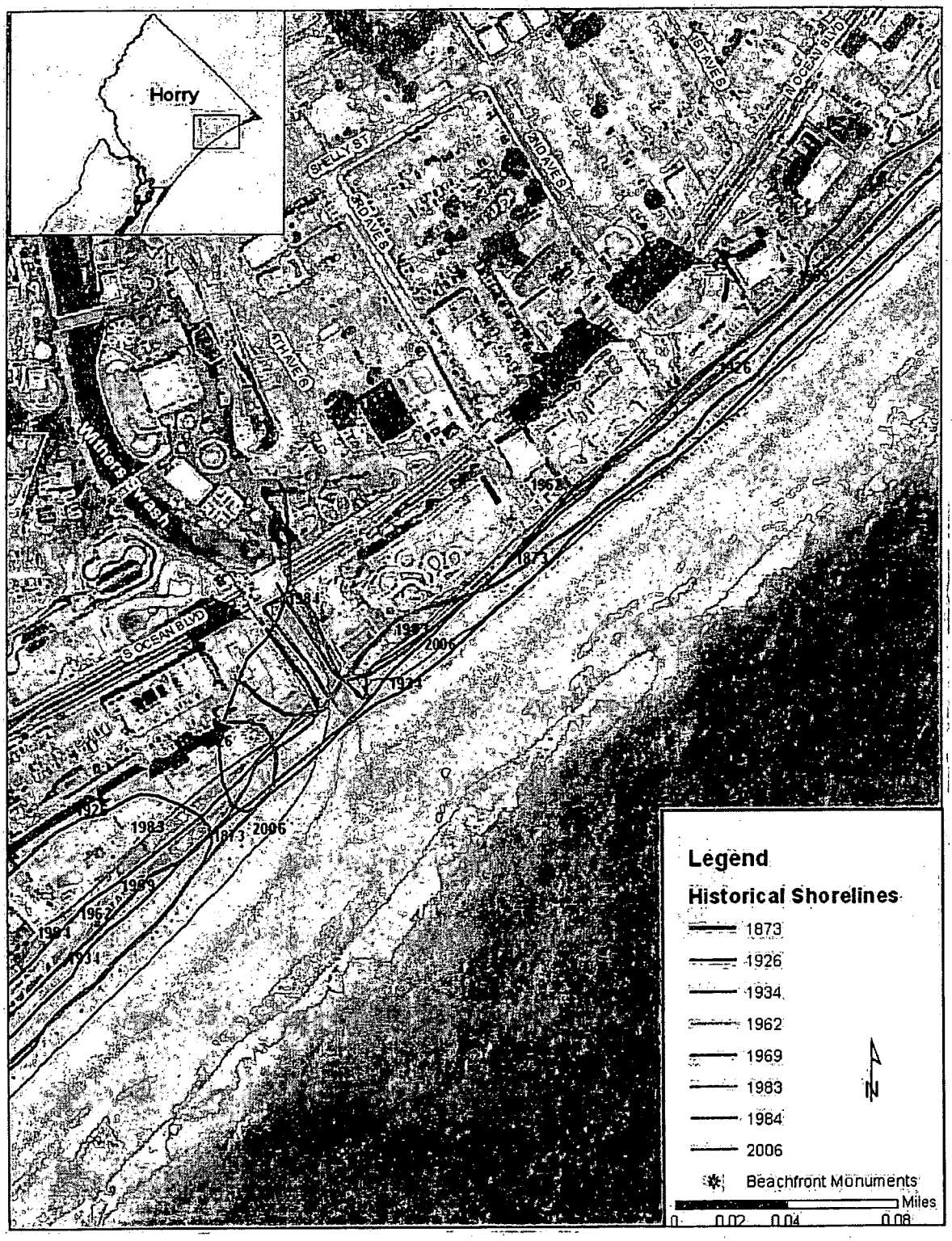
Monument	Beach Classification Zone	Long-Term Erosion Rate (ft/yr)		Monument	Beach Classification Zone	Long-Term Erosion Rate (ft/yr)
5300	Standard	-0.43		5435B	Standard	-0.75
5310	Standard	-0.30		5440B	Standard	-0.52
5320	Standard	-0.33		5445B	Standard	-0.66
5330	Standard	-0.95		5450B	Standard	-0.79
5340	Standard	-1.05		5455B	Standard	-0.56
5350	Standard	-0.56		5460B	Standard	-0.66
5400	Standard	-0.49		5465B	Standard	-0.56
5405	Standard	-0.92		5470B	Standard	-0.59
5410	Standard	-1.21		5475B	Standard	-0.10
5415	Standard	-0.79		5480B	Standard	0.03
5420	Standard	-0.82		5500B	Standard	0.03
5425B	Standard	-0.20		5505B	Standard	-0.82
5430	Standard	-0.72				

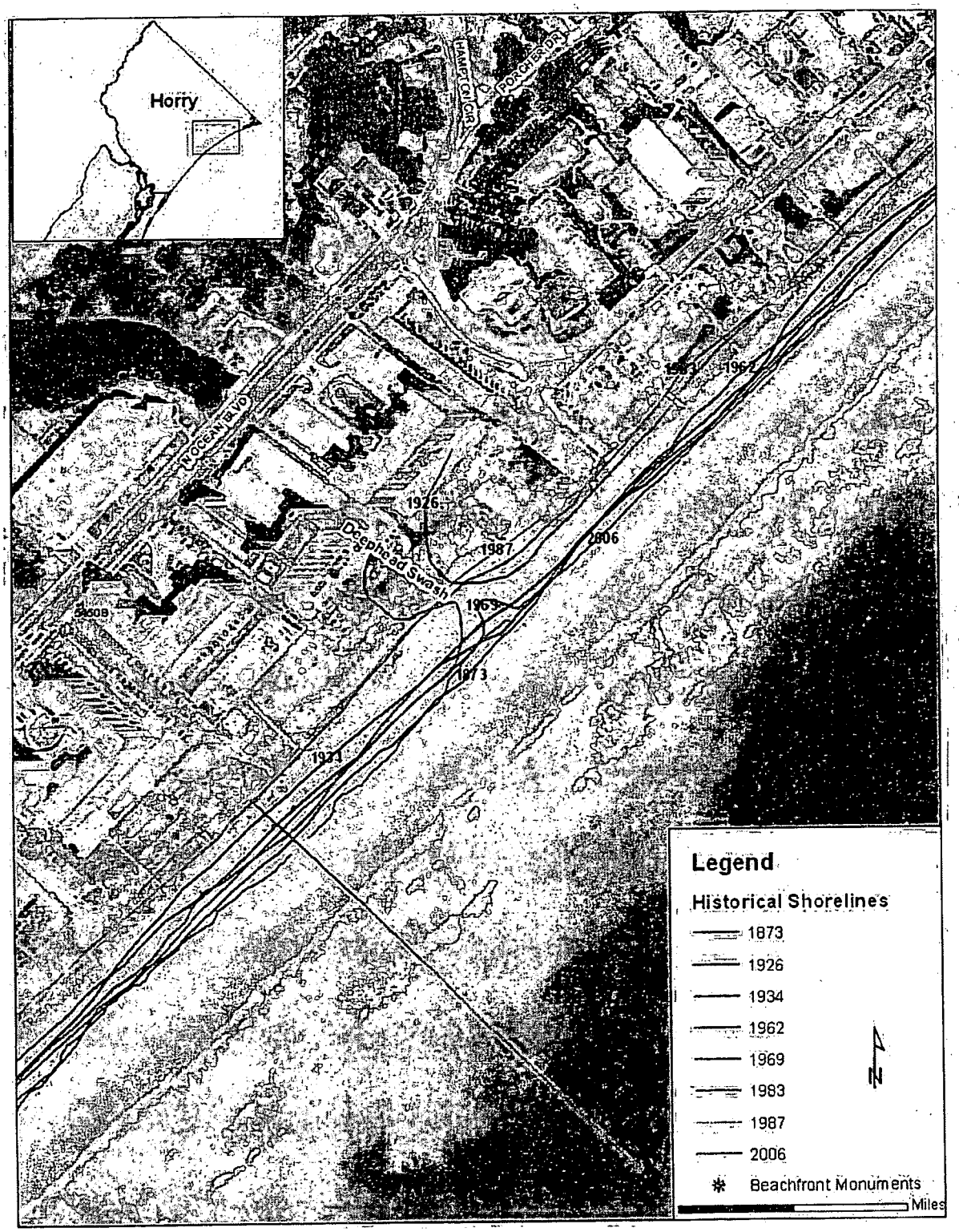
There are two principal sources of historical shoreline change information: 1) historical maps and charts, and 2) historical and recent aerial photographs. Both are available for Myrtle Beach, and both have been used to assess shoreline change.

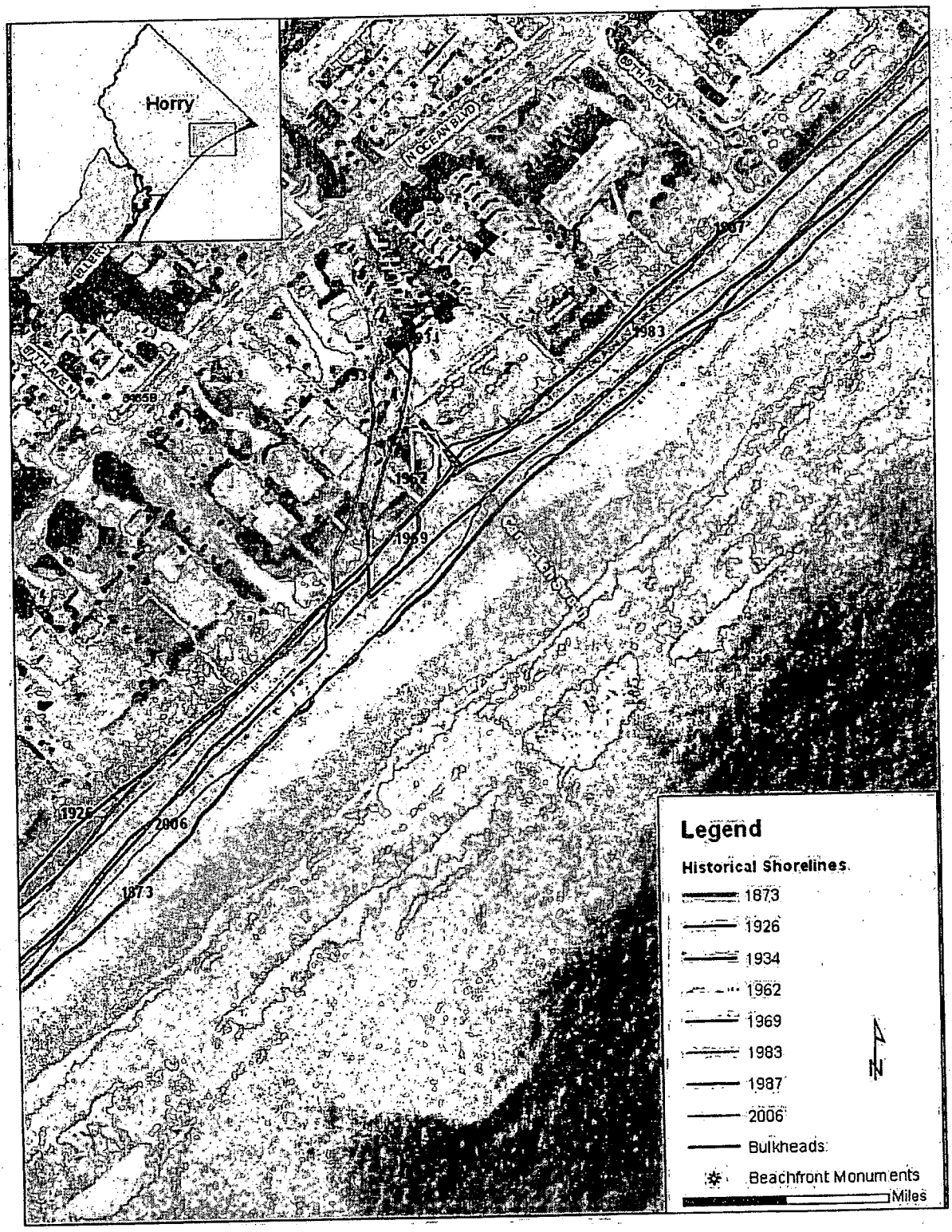
Digital high water shoreline position maps covering Myrtle Beach have been compiled for the years 1872, 1926, 1934, 1962, 1983, 1984, and 2006 DHEC-OCRM reviewed aerial photographs from 1954, 1958, 1963, 1973, and 1988 for the original establishment of its baseline and setback line along Myrtle Beach in 1990. The baseline and setback line were revised in 2010.

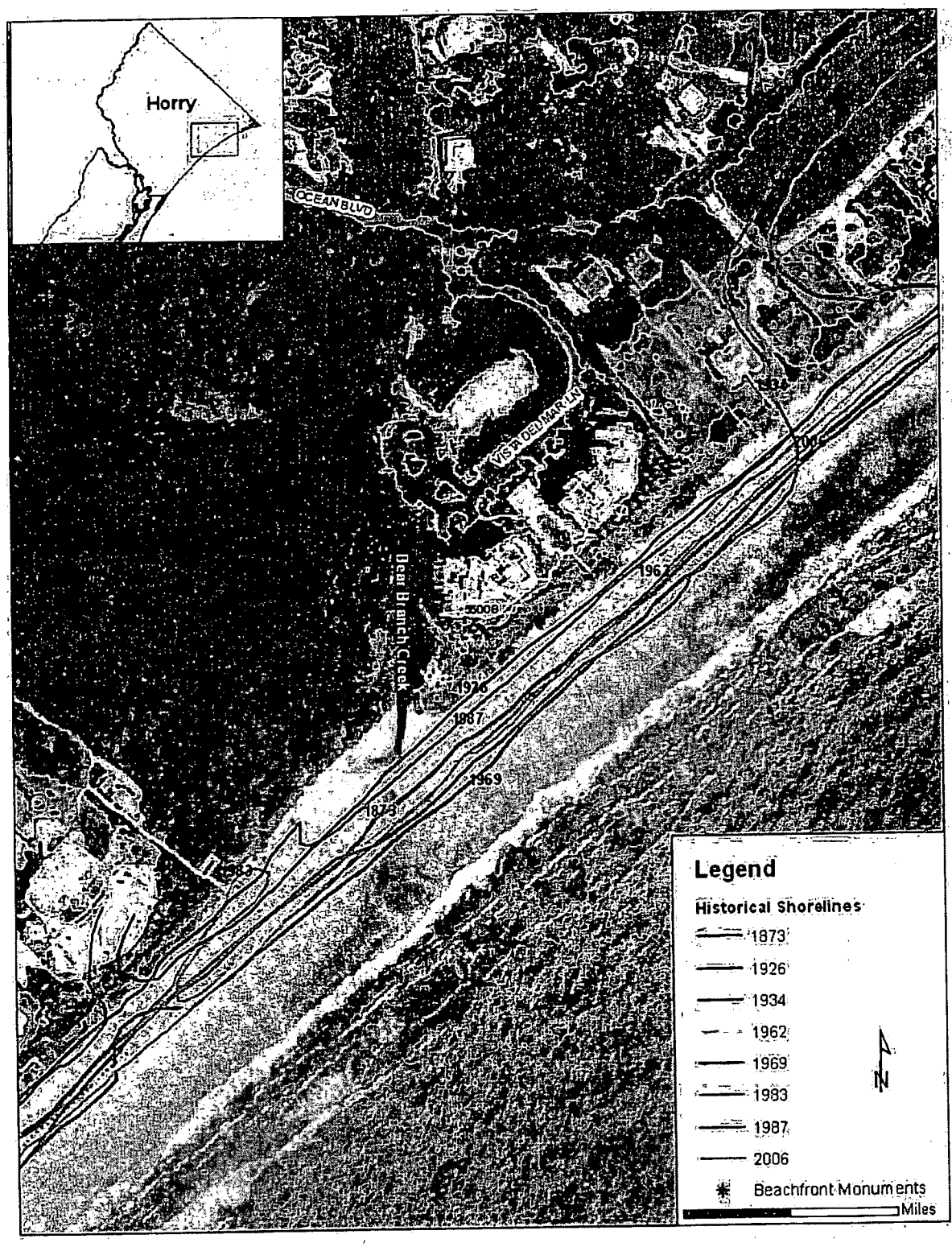
Historical shoreline positions along Myrtle Beach are relatively stable. The swash zones are much more dynamic than standard beach zones, and shoreline positions in these areas tend to fluctuate. Historical shorelines at representative swash zones in Myrtle Beach are shown in the following figures.


Horry
SAND DOLLAR LN
28TH AVE S
28TH AVE S
5300
OCEAN BLVD
OCEAN BLVD
2006
1984
1969
1962
1873
1926
1983
2006
1873
1984
1934
1926
HWY 17
SOUTH BEACH BLVD
SPRINGMAID BLVD
Legend
Historical Shorelines
1873
1926
1934
1962
1969
1983
1984
2006
Beachfront Monuments
0 0.025 0.05 0.1
Miles


Horry
GRELLY ST
30TH AVE S
9TH AVE S
OCEAN BLVD
Withers Swash
S OCEAN BLVD
1962
1873
1984
1926
2006
1934
1983
1969
1962
1934
Legend
Historical Shorelines
1873
1926
1934
1962
1969
1983
1984
2006
Beachfront Monuments
Miles
0
0.02
0.04
0.08


Horry
HAMPTON CIR
PORCHER DR
OCEAN BLVD
1926
1987
2006
Deephead Swash
1969
1973
1934
1962
Legend
Historical Shorelines
1873
1926
1934
1962
1969
1983
1987
2006
Beachfront Monuments
Miles


Horry
N OCEAN BLVD
9TH AVE N
1987
1983
1969
1962
1959
1934
1926
2006
1873
Legend
Historical Shorelines
1873
1926
1934
1962
1969
1983
1987
2006
Bulkheads
Beachfront Monuments
Miles


Horry
OCEAN BLVD
VISTA DEL MAR LN
Bear Branch Creek
1962
1926
1887
1969
1873
1983
2006
Legend
Historical Shorelines
1873
1926
1934
1962
1969
1983
1987
2006
Beachfront Monuments
Miles
N

5.2. Beach Alteration Inventory

5.2.1. Sediment Budgets

A sediment budget is an accounting of sand gains or losses within a defined littoral zone. An eroding beach has a net budget deficit: an accreting beach has a sediment budget surplus. A sediment budget is calculated by comparing beach profile surveys, such as those compiled by CSE over a number of years.

In 1984, Research Planning Institute, Inc. analyzed historic data to determine a sand budget for Myrtle Beach. The data showed that between 1955 an 1983 Myrtle Beach experienced a loss of 575,000 cubic yards of sand that represents an average annual loss of approximately 21,000 cubic yards. However, within those 28 years, the period from February 1981 to September 1983 saw a much greater rate of erosion. Approximately 245, 000 cubic yards of sand were eroded from the city's beach, an average loss of about 100,000 cubic yards per year.

In a monitoring report of the emergency renourishment after Hurricane Hugo (approximately 377,000 cubic yards of sand), Coastal Science & Engineering, Inc. found that the beach gained some 672,000 cubic yards of sand between December 1989 and October 1990. That figure, based on measurements in April and October 1990, includes some 310,000 cubic yards (78 percent) of the emergency fill remaining after the 1989/1990 winter and an additional 363,000 cubic yards of accretion during the summer.

A complete sand budget has been calculated by CSE since its detailed profile analysis in October, 1985. With four renourishment projects (1985/1986,1990,1997 and 2008) the total beach fill amounts to 4, 877,975 cubic yards. Based on the most recent surveys in the spring of 2009, 2,730,000 cubic yards of sand remain in the system from elevation +10 to -5' NGVD.

5.2.2. Past Renourishment Projects

Myrtle Beach undertook its first renourishment program in 1986 and over the course of two winters trucked 853,000 cubic yards of sand to the public beach. Hurricane Hugo in 1989 caused severe erosion problems along the city's beaches and as a result, 377,000 cubic yards were placed along the beaches during the winter of 1990 using emergency restoration funds from the Federal Emergency Management Agency (FEMA).

In the late 1980's, the US Army Corps of Engineers began a feasibility study for the renourishment of the Myrtle Beach area. In 1993, a *General Design Memorandum* was published recommending 1,830,000 cubic yards of fill be placed over a 9.23 mile stretch of the city's beach. On August 15, 1995, the City and the US Army Corps of Engineers signed a *Project Cooperative Agreement* to begin renourishment. The renourishment program was authorized by Congress to run for 50 years beginning in 1996 and ending in 2046. This authorization was derived from the *Water Resources Development Act of 1990*. During final design, the project specifications were written to place 2,150,000 cubic yards of sand along 9.24 miles of beach. Myrtle Beach was designated as Reach 2 along the Grand Strand. This authorization also included the Surfside, Garden City area (Reach 1) and the North Myrtle Beach area (Reach 3). This work was completed in early 1997 with the Federal government's cost share at 65 percent and the local and State match at 35 percent.

5.2.3. Recent Renourishment Projects

In 2008, the US Army Corps of Engineers determined that a periodic renourishment was needed for the three reaches and the Myrtle Beach share of this project was for the placement of 1,500,000 cubic yards over nine miles of beach. The cost sharing formula for this project remained the same as for the original work in 1996-1997.

The US Army Corps of Engineers' renourishment efforts are based solely on storm protection. The guidelines along the Myrtle Beach reach call for a storm protection berm to be no less than 15' wide at an elevation of 9' NGVD (National Geodetic Vertical Datum). At such time as this berm is breached on more than 25 percent of the beach length, an interim renourishment project is to be conducted.

5.2.4. Emergency Orders and Sandbags

The term "emergency" is defined by the SC Coastal Tidelands and Wetlands Act as "any unusual incident resulting from natural or unnatural causes which endanger the health, safety, or resources of the residents of the State, including damages or erosion to any beach or shore resulting from a hurricane, storm, or other such violent disturbance."[1] DHEC-OCRM does not consider long-term, chronic erosion as an "emergency." Emergency situations before or after a storm event often prompt local governments to issue Emergency Orders, which allow property owners to construct temporary barriers against wave uprush through one or a combination of the following erosion mitigation techniques: sandbagging, sand scraping, or minor renourishment.[2] Property owners being protected by sandbags are responsible for the maintenance of the bags to insure that they remain in place and in good repair, and they are also responsible for the complete removal of the bags.[3]

If an event (such as when local emergency orders will be authorized during an erosion emergency) occurs such that City staff feels that some emergency protection needs to be provided to any structure (deck, building, parking, etc.) or the general public may be at peril during beach use, an emergency order will be issued by the City Manager that would cause City staff to apply for an emergency order from the OCRM to remediate the problem through either sand scraping, sand hauling, sand bagging, or some other means to correct the problem on a short term basis. There have been no past Emergency Orders issued in Myrtle Beach.

5.3 Discussion of Erosion Control Alternatives

As is the case of most coastal communities, erosion can and does threaten upland structures and infrastructure in Myrtle Beach. Managing this risk is essential to preserve the recreational beaches, the tax base and ensure the safety of its citizens.

Erosion control methods currently utilized by Myrtle Beach include functional seawalls and beach renourishment. The City also has a program for dune upkeep and regular maintenance of the vegetation as part of the dune system.

5.3.1 Beach Renourishment

As discussed in Section 5.2.2, Myrtle Beach has a 50year Congressional authorization through 2045 for renourishment. In the late 1980's, the US Army Corps of Engineers began a feasibility study for the renourishment of the Myrtle Beach area. In 1993, a *General Design Memorandum* was published recommending 1,830,000 cubic yards of fill be placed over a 9.23 mile stretch of the city's beach. On August 15, 1995, the City and the US Army Corps of Engineers signed a *Project Cooperative Agreement* to begin renourishment. The renourishment program was authorized by Congress to run for 50 years beginning in 1996 and ending in 2046. This authorization was derived from the *Water Resources Development Act of 1990*.

Beach renourishment has and continues to be the city's preferred erosion control alternative.

6.0 Needs, Goals and Implementation Strategies

6.1. Retreat Policy

6.1.1 Mandated Beachfront Setback and Protection Regulations

The Beachfront Management Act of 1990 establishes as a policy of the State the creation of comprehensive, long-range beach management plans at the State and local levels. The plans are to promote the wise use of the beach/dune system, including a gradual retreat of development from the system over a 40-year period.

SCDHEC's OCRM has implemented that policy by establishing a baseline (the crest of the primary dune) and a 40-year setback line (a line landward of the baseline at a distance which is 40 times the average annual erosion rate) for Myrtle

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[1] SC Code § 48-39-10(U).
[2] R. 30-15(H).
[3] R. 30-15(H).

Beach. OCRM has also established a permitting system regulating the construction and reconstruction of habitable structures, erosion control devices, pools, and other structures and land uses seaward of the two lines.

The State's Beach Management Act requires local plans to include a 40 year retreat policy that should consider relocation of buildings, removal of erosion control structures and relocation of utilities.
In March 1985, the Myrtle Beach City Council enacted the CP Coastal Protection Overlay District, which implements a retreat strategy for the city. The City's strategy is based on a 50-year period of erosion, and includes a 50-year setback line based on an erosion rate of 0.68 feet per year as measured from the crest of the primary dune.

The provisions of the CP district prohibit the construction of any new habitable structures seaward of the 50-year setback line. Under certain conditions, open-air amusement uses, pools, and erosion control structures may be built. Also, certain minor structures, such as decks, walkways, lighting, and landscaping, may be built if design standards are met.

The retreat strategy envisions the gradual movement landward of the setback line and baseline as erosion occurs over the years. The provisions of the CP District are written such that the City's baseline is coincident with the OCRM baseline. Any adjustment made in the OCRM baseline will be reflected in a corresponding change to the City's baselines, and therefore the City's 50-year setback line. If erosion continues and the setback line and baseline move landward, more structures will become affected by the regulations pertaining to the two lines.

A retreat strategy must include ways of dealing with structures seaward of the setback line or baselines which become severely damaged. At some point, the damaged structures must be relocated or removed.

The Beachfront Management Act requires the retreat strategy to address the relocation or removal of buildings, erosion control structures, and utilities. Myrtle Beach embraces a retreat strategy in conjunction with a strong commitment to renourishment. As long as beach renourishment maintains a recreational beach and protection of oceanfront properties in an economical way, the City will continue the two policies. It is the City's hope that renourishment will forestall the landward movement of the baseline. Despite the slowing of that landward movement, the City accepts the generally held belief that the movement will eventually occur as the sea level continues to rise. For that reason, the City retains its retreat strategy while it continues a program of beach renourishment.

Reconstruction of an existing structure seaward of the 50-year setback line (that is, a nonconforming structure under the CP District regulations) is allowed by the *Zoning Ordinance*. A reconstructed building or swimming pool may be no larger in area and no further seaward than the structure being replaced. In addition, the reconstruction cannot require an erosion control structure and must comply with all applicable design standards, landscape and parking requirements, and drainage regulations.

A nonconforming parking lot that is damaged by a disaster to the point where the cost of repair exceeds 60 percent of the lot's replacement cost may be reconstructed if design standards, landscaping and parking requirements, and drainage regulations are met.

In comparison to OCRM's regulations for reconstruction of existing buildings, the City's regulations are less restrictive. The City does not require the reconstructed building to be located as far landward as possible, does not require the linear footage of the reconstructed building parallel to the coast to be no greater than that of the original building, and does not prohibit the reconstruction from being seaward of the baseline (these are OCRM requirements if the destruction is the result of natural causes; if the destruction if caused by man, the replacement building must be no larger than the original, no father seaward than the original, and as far landward as possible). However, the City does require the reconstruction to meet certain requirements of the *Zoning Ordinance*, which might mean that a building smaller than the original would be mandated.

The regulation of reconstruction of destroyed pools and parking lots by the City and OCRM is in agreement, except that OCRM requires the reconstructed pool to be built as far landward as possible and the City requires the rebuilt parking lot to comply with certain zoning standards, which would probably result in a lot that is smaller than the original.

The City's Oceanfront Development Standards contained in the *Zoning Ordinance* require a permit for repairing an erosion control device. However, when a structure is in need of repair costing more than 50 percent of the value of the structure at the time of application, the landowner must meet all the criteria of an application for initial construction. For example, erosion imminently threatens a permanent improvement which existed before the oceanfront standards were enacted or which were constructed landward of the 50-year setback line, that all reasonable soft erosion control measures have been attempted, and that a OCRM permit be obtained.

OCRM's regulations are more restrictive because it does not allow destroyed erosion control structures to be replaced. The OCRM definition of what constitutes a destroyed erosion control device also differs from the City's definition. The effect of the City's regulations is consistent with OCRM's because the City requires an OCRM permit for the reconstruction of an erosion control structure.

The City requires stormwater control facilities to be replaced when they are destroyed, and new facilities have to be provided when destroyed buildings and parking lots are reconstructed. Before the *1992 City of Myrtle Beach Management Plan* was written the City had removed sanitary sewers and other utilities from the public beach. The City also replaced utilities which were necessary to serve properties in the area; in some cases it was possible to relocate the utilities farther landward than the original which is consistent with OCRM requirements.

The City also has made significant strides to reduce repetitive loss properties. FEMA'S National Flood Insurance Program designated Myrtle Beach as a repetitive loss community in 1996 with 17 properties. In 2004 Myrtle Beach had 64 repetitive loss properties and the City began focusing on reducing that number. In 2009, the number was reduced to 21 "non-mitigated" repetitive loss properties. This includes 18 residential properties and 3 commercial properties (hotels). The repetitive loss properties can be assigned to the one oceanfront area, three riverine situations along swashes, and occasional isolated areas. The oceanfront of Myrtle Beach is exposed to flooding from storms that come in from the ocean, hurricanes, waterspouts, and northeasters. Most of the repetitive loss properties in this area are east of Ocean Boulevard, which generally corresponds to the VE zones on the FEMA Federal Insurance Rate Maps. The oceanfront in Myrtle Beach has relatively high elevations compared to the barrier islands along the coast to the north and south. The *2011 City of Myrtle Beach Floodplain Management and Hazard Mitigation Plan* includes a mitigation strategy that will address specifically targeted hazard risks such as the acquisition and relocation of repetitive loss structures. Acquisition has been used in the past, specifically with properties in the Withers Swash community. The City has recently acquired property along the channel part of the swash at South Kings Highway and 3rd Avenue South.

One type of regulation that could help to implement the retreat strategy more than any existing provisions of the *Zoning Ordinance* is the transfer of development rights. It might be possible to draft regulations which will permit a property owner to transfer all or a portion of the development allowed on a parcel east of Ocean Boulevard to land west of that street. The transferred right of development would be in addition to the amount of development already allowed on the land west of Ocean Boulevard. The transferred right of development would be in addition to the amount of development already allowed on the land west of Ocean Boulevard. This would remove development pressures at the beachfront without a loss in overall property value.

Finally, the City enforces the International Property Maintenance Code, Section 301.3 to address the abandonment of properties along the active beach. Also see Section 703 of the City's Zoning Ordinance.

6.2. Strategy for Preserving and Enhancing Public Beach Access

Unprecedented growth has taken place in the coastal zones over past 25 years. With this in mind the State now provides direction to preserve existing public access sites by regulatory control and requires that development projects in beachfront areas allow the public the right to reach the beach. The people of SC through a legal principle known as the public trust doctrine, own all land below the mean high water mark and consequently the beach.

The *Beachfront Management Act* mandates the preservation of existing public access and promotes the enhancement of public access for all citizens including the handicapped and encourages the purchase of lands adjacent to the Atlantic Ocean to enhance public access.

The City will continue to provide access at all the publicly owned land where access is now provided. The City will increase the number of access points as the opportunity to purchase property and the budget allows as was done in 2010 with the addition of the 1.2 mile boardwalk between 14th Avenue North and 1st Avenue N.

The walkovers built in the last 5 years or so should have a lifespan of approximately 15 years. There are approximately 40 dune walkovers that will need to be replaced during the next six to seven years. In 2011 two of the walkovers will be converted to handicapped access (north of 70th Avenue N) to achieve the requirement of a handicapped walkover every ½ mile. The City's goal is to replace 6-7 walkovers per year for the next 10 years.

7.2.1 Walkovers and Decks in Priority of Replacement (December 2010)		
65TH AVE. N.	#1	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
73RD AVE. N.	# 2	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
2002 N. OCEAN BLVD	#3	WALKWAY / HANDRAILS / STEPS
80TH AVE. N.	# 4	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
27TH AVE. N.	# 5	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
25TH AVE. N.	# 6	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
44TH AVE. N.	#7	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
81ST AVE. N.	# 8	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
2108 N. OCEAN BLVD	# 9	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
74TH AVE. N.	# 10	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
1502 N. OCEAN BLVD	# 11	WALKWAY / DECK / HANDRAILS / STEPS
2600 N. OCEAN BLVD.	# 12	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
49TH AVE. N.	#13	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
2302 N. OCEAN BLVD.	# 14	WALKWAY / DECK / HANDRAILS / STEPS
2200 N. OCEAN BLVD	# 15	WALKWAY / DECK / HANDRAILS / STEPS
29TH AVE. N.	# 16	WALKWAY / DECK / HANDRAILS / STEPS
69TH AVE. N.	# 17	WALKWAY / FLUME / HANDRAILS
BEACH PLACE (CABANA)	# 18	WALKWAY / DECK / HANDRAILS / STEPS
78TH AVE. N.	# 19	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
37TH AVE. N.	# 20	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
46TH AVE. N.	# 21	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
34TH AVE. N.	# 22	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
71ST AVE. N.	# 23	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
43RD AVE. N.	# 24	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
61ST AVE. N.	# 25	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
72ND AVE. N. (SMALL)	# 26	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
82ND AVE. N.	# 27	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
39TH AVE. N.	# 28	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
50TH AVE. N.	# 29	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
79TH AVE. N.	# 30	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS / GAZEBO
40TH AVE. N.	# 31	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
45TH AVE. N.	# 32	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
77TH AVE. N.	# 33	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
52ND AVE. N.	# 34	DECK / HANDRAIL / STEPS
10TH AVE. S.	# 35	DECK / HANDRAIL / STEPS
2314 N. OCEAN BLVD.	# 36	WALKWAY / DECK / HANDRAIL / STEPS
2000 N. OCEAN BLVD	# 37	WALKWAY / DECK / HANDRAIL / STEPS
2802 N. OCEAN BLVD.	# 38	WALKWAY / DECK / HANDRAIL / STEPS (NO SIGN AT STREET)
67TH AVE. N.	# 39	WALKWAY / DECK / HANDRAIL / STEPS
75TH AVE. N.	# 40	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
28TH AVE. S.	# 41	DECK / STEPS / HANDRAIL
27TH AVE. S.(RIGHT SIDE)	# 42	WALKWAY / DECK / HANDRAIL / STEPS

6TH AVE. S.	#43	DECK / HANDRAIL / STEPS
1604 N. OCEAN BLVD.	# 44	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
1702 N. OCEAN BLVD.	#45	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
1804 N. OCEAN BLVD.	# 46	WALKWAY / DECK / HANDRAILS / STEPS
2206 N. OCEAN BLVD.	#47	WALKWAY / DECK / HANDRAILS / STEPS
28TH AVE. N. CAMERON PK.	# 48	WALKWAYS / DECKS/ HANDRAILS / STEPS
2802 N. OCEAN BLVD.	#49	WALKWAY / DECK / HANDRAILS / STEPS
2804 N. OCEAN BLVD.	# 50	WALKWAY / DECK / HANDRAILS / STEPS
42ND AVE. N.	#51	DECK / HANDRAIL / STEPS
67TH AVE. N.	# 52	WALKWAY / DECK / HANDRAILS / STEPS
75TH AVE. N.	#53	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
8702 N. (DUNES CLUB)	# 54	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS
8900 N. (DUNES CLUB)	#55	WALKOVER / HANDRAIL / STEPS
27TH AVE. S. (LEFT SIDE)	# 56	WALKWAY / HANDRAILS / STEPS
25TH AVE. S.	#57	WALKWAY / DECK / HANDRAILS / STEPS
7TH AVE. S.	#58	WALKWAY / DECK / HANDRAILS / STEPS
63RD AVE. N.	#59	WALKWAY / DECK / WALKOVER / HANDRAILS / STEPS

The City will regulate encroachments of exclusive private land uses on City-owned oceanfront property to ensure access by the public and to maintain public open space. The Public Works Department and Parks Division continues to maintain all dune walkovers including handicapped access at publicly owned access points in their current, or improved, condition. Where walkovers are not located over dunes, the Public Works Department and Parks Division will review their placement and determine if any should be relocated. The staff will also determine if improved surfaces which cut through dunes should be replaced with walkovers. Any changes that are deemed appropriate will be made when the walkovers need major repairs. The City will continue to maintain all emergency access points. Where possible, small dunes will be created to retain stormwater and reduce beach erosion down-slope of the emergency access points. The City will continue to enforce the prohibition of unauthorized vehicles using the emergency access points to gain access to the beach; will work with groups which advocate the rights of physically challenged persons to assess their needs for improved beach access and will implement all feasible recommendations and maintain all beach access signs which currently exist. All trash, cigarette and dog waste receptacles will be serviced on a regular basis. The City will continue to provide outdoor foot and body showers at designated beach access points, lifeguard stations along the nonresidential areas of the beach, and the Beach Patrol and ocean rescue services and contracting with lifeguard companies to provide lifeguard services. The City should determine the feasibility of providing regional beach access facilities with necessary amenities. The City will continue to provide parking at street ends and along streets for use by the general public. The Department of Public Works and Planning will begin planning and providing for bicycle and additional golf cart parking of the street-ends where residential areas are adjacent to or near the beach.

6.3 Public Outreach and Education

The Public Information Office provides numerous opportunities for public outreach and education through the City's website, www.cityofmyrtlebeach.com; MBTV, broadcast over Time Warner Cable on Channel 15 and Horry Telephone Cooperative on Channel 9 in residential areas and commercial establishments; and other publications, including the *Progress Report* newsletter, to provide information on the following subjects and others:

- Disturbing or damaging the dunes or sea grass is illegal, subject to a fine of up to $500 and/or 30 days, upon conviction.
- Pet owners are responsible for picking up after their pets and properly disposing of droppings whenever the pets are off the owners' property. This includes the public beach.
- The dates and hours when dogs are allowed on the beach and boardwalk.
- Rip current safety information for swimmers, in both English and Spanish, during the swimming season.

- Swim Safe tips and the meaning of the ocean condition flags posted by the lifeguards. (By the way, the Grand Strand beaches standardized those flags about 10 years ago and adopted the Swim Safe program. A yellow flag means "lifeguard on duty," a blue flag means "aquatic danger" and a red flag means "no swimming.")
- Anti-littering ordinances, along with ordinances prohibiting glass containers, alcoholic beverages and fireworks on the beach.
- Grab It and Bag It, with dispensers at beach accesses
- The prohibition against leaving items on the beach overnight.
- Stormwater pollution precautions and prevention measures.
- Hurricane evacuation routes and preparation tips, including the fact that the city has received both Storm Ready and Tsunami Ready status from the National Weather Service.
- Fishing regulations, metal detecting guidelines and horse-back riding times for the beach, as well as information about getting married on the public beach or in one of the oceanfront parks.
- Meetings and agendas for the Beach Advisory Committee.

Additional web pages of interest for the above topics include:

www.cityofmyrtlebeach.com/handicapped.html
www.cityofmyrtlebeach.com/flood.html
www.cityofmyrtlebeach.com/beachlaws.html
www.cityofmyrtlebeach.com/hurricane.html
www.cityofmyrtlebeach.com/faq.html (fishing rules, weddings, etc.)

APPENDICES

Appendix A: Full and Complete Public Access in Myrtle Beach

Type of Facility	Length of Beach to Which Access is Provided - Distance on Either Side of Access Point Which Will be Considered as Having Full and Complete Access	Minimum Facilities
Public Access Point	**1/8 mile (660 feet)**	**Trash receptacles, walkover/improved surface access, signage, on-street parking for 6 vehicles**
28th Ave S		On-street parking on Ocean Blvd is available between 28th and 27th Ave N beach access – 8 spaces east side and 10 spaces west side , handicapped access, emergency auto access, shower tower, trash receptacles, signage, walkover with deck with seating -
2103C S Ocean Blvd		Walkover deck without seating, steps foot path
1903 C S Ocean Blvd		Handicapped access, trash and cigarette receptacles, signage, walkover deck with seating
1809 S Ocean Blvd		Handicapped access, trash receptacles, signage, walkover deck with seating, steps footpath
13th Ave S		6 parking spaces, trash receptacles, signage, walkover deck without seating, steps footpath, designated handicapped parking
12th Ave S		4 parking spaces, handicapped access, emergency access, shower tower, trash and cigarette receptacles, signage, walkover deck with seating, golf cart parking stalls
11th Ave S		6 parking spaces, emergency access, trash and cigarette receptacles, signage, walkover deck with seating, steps footpath
Withers Swash		Handicapped access, emergency access, trash receptacles, signage, walkover deck with seating
3rd Ave S		Handicapped access, emergency access, trash receptacles, walkover deck with seating, designated handicapped parking
2nd Ave S		7 parking spaces, trash receptacles, steps footpath
1st Ave S		Shower tower, trash receptacles, signage, walkover deck with seating, steps footpath, designated handicapped parking

1st Ave N	Shower tower, drinking fountain, trash receptacles, walkover deck with seating, steps footpath, designated handicapped parking, bike rack
2nd Ave N Boardwalk	Handicapped access, emergency access, trash and cigarette receptacles, signage, concessions, golf cart parking stalls, bike rack
3rd Ave N	Trash and cigarette receptacles, walkover deck with seating, steps footpath, bike rack
3rd Ave N Boardwalk	2 parking spaces, shower tower, drinking fountain, trash and cigarette receptacles, walkover deck with seating
4th Ave N	4 parking spaces, trash receptacles, walkover deck with seating, steps footpath, designated handicapped parking, bike rack
4th Ave N Boardwalk	Handicapped access, trash and cigarette receptacles, walkover deck without seating
5th Ave N Boardwalk	Shower tower, drinking fountain, trash and cigarette receptacles, walkover deck without seating, steps footpath, designated handicapped parking, bike rack
7th Ave N	2 parking spaces, trash and cigarette receptacles, walkover deck with seating, steps foot path, bike rack
7th Ave N Boardwalk	On-street parking, handicapped access, emergency access, shower tower, drinking fountain, trash and cigarette receptacles, signage, walkover deck with seating, designated handicapped parking
8th Ave N Boardwalk	On-street parking, shower tower, drinking fountain, restrooms, trash and cigarette receptacles, designated handicapped parking
1400 N Ocean Blvd	Shower tower, trash and cigarette receptacles, steps foot path
1402 N Ocean Blvd	Handicapped access, emergency access, trash receptacles, signage
1404 N Ocean Blvd	Signage, walkover deck with seating
1502 N Ocean Blvd	Signage, steps foot path, trash receptacles
1504 N Ocean Blvd	Emergency auto access, signage, steps foot path, trash receptacles
1506 N Ocean Blvd	Signage, steps footpath

1600 N Ocean Blvd	Handicapped access, walkover deck with seating, signage, steps foot path
1602 N Ocean Blvd	Handicapped and emergency access, trash receptacles, signage, walkover deck with seating, steps foot path
1604A N Ocean Blvd	Trash receptacles, walkover deck without seating, steps foot path
1604B N Ocean Blvd	Trash receptacles, signage, walkover deck without seating, steps foot path
1700 N Ocean Blvd	Trash receptacles, walkover deck without seating
1702B N Ocean Blvd	Trash receptacles
1708B N Ocean Blvd	Trash receptacles
1708C N Ocean Blvd	Handicapped access, walkover deck with seating
1800 N Ocean Blvd	Handicapped access, trash receptacles, signage, walkover deck with seating
1802 N Ocean Blvd	Trash receptacles, signage, walkover deck with seating, steps foot path
1804 N Ocean Blvd	Emergency access, trash receptacles, signage, steps footpath
Anderson Park S	Shower tower, trash receptacles, walkover deck with seating, walkover deck without seating
Anderson Park N	Handicapped access, shower tower, trash receptacles, signage, walkover deck with seating
2000B N Ocean Blvd	Shower tower, trash receptacles, signage, walkover deck without seating
2002 N Ocean Blvd	Shower tower, trash receptacles, signage, walkover deck without seating, steps foot path
2106 N Ocean Blvd	Handicapped access, trash receptacles, signage, walkover deck with seating
2108 N Ocean Blvd	Handicapped access, trash receptacles, signage, walkover deck with seating, steps foot path
2202 N Ocean Blvd	Shower tower, trash receptacles, walkover deck with seating, steps foot path
2206 N Ocean Blvd	Shower tower, trash receptacles, steps footpath
2300 B N Ocean Blvd	Shower tower, trash receptacles, walkover deck

	with seating, steps foot path
2302 N Ocean Blvd	Shower tower, trash receptacles, signage, walkover deck with seating
2304B N Ocean Blvd	Trash receptacles, signage, steps foot path
2310 N Ocean Blvd	Trash receptacles, signage, walkover deck with seating, steps foot path
2314 N Ocean Blvd	Trash receptacles, walkover deck with seating, steps foot path
24th Ave N	Handicapped access, emergency access, shower tower, restrooms, trash receptacles, signage, steps foot path, designated handicapped parking
2400 N Ocean Blvd	Shower tower, restrooms, trash receptacles, swings, playground, designated handicapped parking
2406 N Ocean Blvd	Trash receptacles, signage, walkover deck without seating
2500 N Ocean Blvd	Handicap access, shower tower, trash receptacles, walkover deck with seating
2502 N Ocean Blvd	Shower tower, trash and cigarette receptacles, signage, walkover deck with seating
2504 N Ocean Blvd	Handicapped access, shower tower, trash receptacle, signage, walkover deck without seating
2600 N Ocean Blvd	Trash receptacles, signage, walkover deck with seating
2606 N Ocean Blvd	Shower tower, trash receptacles, signage, walkover deck with seating
2608 N Ocean Blvd	Trash receptacles, walkover deck with seating
2610 N Ocean Blvd	Trash receptacles, signage, walkover deck with seating
2700 N Ocean Blvd	Trash and cigarette receptacles, signage, walkover deck with seating
Cameron Park	4 parking spaces, shower tower, trash receptacles, signage, designated handicapped parking
2804 N Ocean Blvd	Trash receptacles, signage, walkover deck with seating
2808 N Ocean Blvd	Trash receptacles, signage, walkover deck with seating, walkover deck without seating

3002 N Ocean Blvd	Trash receptacles, shower tower, walkover deck without seating
31st Ave N	4 parking spaces, handicapped and emergency access, signage, walkover deck with seating
37th Ave N	5 parking spaces, shower tower, trash receptacles, signage, walkover deck with seating, swings
38th Ave N	5 parking spaces, handicap access, shower tower, trash receptacles, signage, walkover deck with seating, designated handicapped parking
39th Ave N	5 parking spaces, shower tower, trash receptacles, signage, walkover deck with seating
40th Ave N	4 parking spaces, shower tower, trash receptacles, signage, walkover deck with seating
47th Ave N	Handicap access, shower tower, trash receptacles, signage, walkover deck with seating, designated handicapped parking
49th Ave N	4 parking spaces, shower tower, trash receptacles, walkover deck with seating, steps foot path
50th Ave N	4 parking spaces, shower tower, trash receptacles, signage, walkover deck with seating, golf cart parking stalls
53rd Ave N	Trash receptacles, designated handicapped parking, golf cart parking stalls
Gardens by the Sea Park	Handicap and emergency access, shower tower, drinking fountain, restrooms, trash receptacles, dog waste bag container, signage, walkover deck with seating, swings, playground, designated handicap parking, golf cart parking stalls
5524 N Ocean Blvd	Handicap and emergency access, trash receptacles, dog waste bag containers, signage, walkover deck with seating
5700 N Ocean Blvd	Handicap and emergency access, signage, walkover deck with seating
73rd Ave N	Shower tower, trash receptacles, signage, walkover deck with seating, steps foot path, golf cart parking stalls

Local Public Access Park	¼ mile (1320 feet)	As above parking for 10 vehicles
29th Ave S		22 parking spaces, handicapped access and designated parking, 4 on-street parking spaces east side of Ocean Blvd, 7 on-street parking spaces west side of Ocean Blvd between 29th and 28th Avenues S., emergency auto access, shower tower, trash receptacles, signage
27th Ave S		11 parking spaces, 1 on-street parking space on east side of Ocean Blvd. and 2 on-street parking spaces on west side of Ocean Blvd. between 27th and 26th Avenues S., trash receptacles
26th Ave S		19 parking spaces, 13 on-street parking spaces on the east side of Ocean Blvd and 8 on-street parking spaces on the west side of Ocean Blvd. between 26th and 25th Avenues S., trash receptacles
25th Ave S		16 parking spaces, 11 on-street parking spaces on east side of Ocean Blvd. and 8 on-street parking spaces on the west side of Ocean Blvd. between 25th and 24th Avenues S., trash receptacles, designated handicapped parking
24th Ave S		14 parking spaces, trash receptacles
10th Ave S		12 parking spaces, handicapped access, emergency access, trash and cigarette receptacles, signage, walkover deck with seating, golf cart stalls
8th Ave S		11 parking spaces, handicapped access, emergency access, trash receptacles, signage, steps footpath, golf cart parking stalls
7th Ave S		13 parking spaces, trash receptacles, signage, walkover deck with seating, steps footpath
6th Ave S		14 parking spaces, trash receptacles, signage, walkover deck with seating, steps footpath, golf cart parking stalls
2nd Ave N		23 parking spaces, trash receptacles, concessions, designated handicapped parking
5th Ave N		22 parking spaces, trash and cigarette receptacles, walkover deck with seating, designated handicapped parking
8th Ave N		11 parking spaces, trash and cigarette receptacles, walkover deck with seating, designated handicapped parking
23rd Ave N		21 parking spaces, trash and cigarette receptacles, signage, walkover deck with seating, steps foot path

2300A N Ocean Blvd	18 parking spaces, shower tower, trash receptacles, signage, walkover deck with seating
34th Ave N	12 parking spaces, handicapped access, shower tower, trash receptacles, signage, walkover deck with seating, swings
42nd Ave N	15 parking spaces, trash receptacles, handicap and emergency access, shower tower, signage, walkover deck with seating, golf cart parking stalls
43rd Ave N	11 parking spaces, shower tower, trash receptacles, walkover deck with seating, steps foot path
44th Ave N	12 parking spaces, shower tower, trash receptacles, signage, steps foot path, golf cart parking stalls
46th Ave N	8 parking spaces, shower tower, trash receptacles, signage, walkover deck with seating, steps foot path
48th Ave N	14 parking spaces, handicap access, shower tower, trash receptacles, signage, walkover deck with seating, designated handicapped parking, golf cart parking stalls
51st Ave N	12 parking spaces, handicap access, shower tower, trash receptacles, signage, walkover deck with seating
52nd Ave N	22 parking spaces, handicap and emergency access, shower tower, trash receptacles, signage, walkover deck with seating, steps foot path
65th Ave N	22 parking spaces, handicap access, shower tower, trash receptacles, signage, walkover deck with seating
69th Ave N	17 parking spaces, handicap and emergency access, shower tower, trash receptacles, signage, walkover deck without seating
71st Ave N	17 parking spaces, shower tower, trash receptacles, signage, walkover deck with seating, steps foot path
72nd Ave N	21 parking spaces, shower tower, trash receptacles, signage, walkover deck with seating, steps foot path, designated handicapped parking
74th Ave N	12 parking spaces, shower tower, trash receptacles, signage, walkover deck with

	seating, steps foot path, designated handicapped parking
75th Ave N	14 parking spaces, handicap access, shower tower, trash receptacles, signage, walkover deck with seating
78th Ave N	Shower tower, trash receptacles, signage, walkover deck with seating, steps foot path, 5 parking spaces at access and 17 parking spaces on street
79th Ave N	Emergency access, trash receptacles, signage, walkover deck with seating, steps foot path, 5 parking spaces at access and 13 parking spaces on street
8000A Beach Drive	Shower tower, trash receptacles, signage, walkover deck with seating, steps foot path, golf cart parking stalls, 5 parking spaces at access and 14 parking spaces on street
81st Ave N	Shower tower, trash receptacles, signage, walkover deck with seating, steps foot path, 5 parking spaces at access and 18 parking spaces on street
Neighborhood Public Access Park — ½ mile (2,640 feet)	As above, 25 vehicles
Hurl Rock Park	51 parking spaces, handicapped access and designated parking, emergency access, shower tower, drinking fountain, restroom facilities, trash and cigarette receptacles, signage, walkover deck with seating, steps footpath, golf cart parking stalls
16th Ave S	25 parking spaces, handicapped access, emergency access, trash and cigarette receptacles, signage, walkover deck with seating, golf cart stalls
15th Ave S	41 parking spaces, handicapped access, shower tower, trash and cigarette receptacles, signage, walkover deck with seating
9th Ave S	25 parking spaces, handicapped access, shower tower, trash receptacles, signage, walkover deck with seating, steps footpath, designated handicapped parking
6th Ave N	11 parking spaces with a 54 space public parking lot on Ocean Blvd at 6th Ave N, trash and cigarette receptacles, steps footpath, designated handicapped parking
6th Ave N Boardwalk	Shower tower, drinking fountain, restroom facilities, trash and cigarette receptacles, walkover deck without seating, steps footpath, designated handicapped parking, less than 500 feet on 6th Ave N and Ocean Blvd is a publicly

		owned parking area with 54 spaces
26th B Ave N		26 parking spaces, trash receptacles, signage, walkover deck without seating
64th Ave N		28 parking spaces, handicap access, shower tower, trash receptacles, signage, walkover deck with seating, designated handicapped parking
66th Ave N		25 parking spaces, handicap access, shower tower, trash receptacles, signage, walkover deck with seating
67th Ave N		37 parking spaces, handicap and emergency access, shower tower, trash receptacles, signage, walkover deck without seating, golf cart stalls
70th Ave N		25 parking spaces, handicap access, shower tower, trash receptacles, signage, walkover deck with seating
76th Ave N		26 parking spaces, handicapped access shower tower, trash receptacles, signage, walkover deck without seating, designated handicapped parking
77th Ave N		30 parking spaces, handicap and emergency access, trash receptacles, signage, walkover deck without seating, steps foot path
82nd Ave N		Emergency access, shower tower, trash receptacles, signage, walkover deck with seating, steps foot path, 6 parking spaces at access and 36 parking spaces on street
8702 N Ocean Blvd		Trash receptacles, walkover deck without seating, steps foot path, 50 parking spaces on street within 1000 ft of access
9000 N Ocean Blvd		Trash receptacles, walkover deck without seating, steps foot path,, 48 parking spaces on street within 1000 ft of access
Community Public Access Park	¼ mile (3,960 feet)	As above, showers, lifeguards, concession, handicapped access and parking, parking for 75 vehicles
Regional Public Access Park	1 mile (5,280 feet)	As above, parking for 150 vehicles or greater

The following beach access points are all within 1 mile or less of the 1000 parking space public garage.	
9th Ave N	On-street parking on 9th Ave N between Ocean Blvd and Chester Street has 43 spaces and less than 700 feet away is a public parking garage with 1000 spaces. A boardwalk that stretches from 14th Ave N to 1st Ave S (over 1 mile in length) with multiple access points. handicapped access, shower tower, drinking fountain, restrooms, trash and cigarette receptacles, steps foot path, concessions
902 N Ocean Blvd Boardwalk	Trash and cigarette receptacles, steps foot path and concessions
904 N Ocean Blvd Boardwalk	Trash receptacles, steps foot path, concessions
910 N Ocean Blvd Boardwalk	Trash receptacles, steps foot path, concessions
918 N Ocean Blvd Boardwalk	Trash receptacles, steps foot path, concessions
Plyler Park S Boardwalk	Shower tower, drinking fountain, restrooms, trash and cigarette receptacles, steps foot path, concessions
Plyler Park N Boardwalk	Handicapped access, shower tower, trash and cigarette receptacles, steps foot path
1004 N Ocean Blvd	Steps foot path
1102 N Ocean Blvd	Steps foot path
12th Ave N	On-street parking, handicapped access, emergency access, shower tower, trash and cigarette receptacles, signage
1202 N Ocean Blvd Boardwalk	Trash and cigarette receptacles, steps foot path
1204 N Ocean Blvd Boardwalk	Trash receptacles, steps foot path
1304 N Ocean Blvd Boardwalk	Handicapped access, trash and cigarette receptacles, steps foot path
1306 N Ocean Blvd Boardwalk	Handicapped access, trash and cigarette receptacles, concessions

Section 18-2 Myrtle Beach Stormwater Management Ordinance (Ord. No. 2007-51, 8-14-07)
Sec. 18-3. Definitions.
(a) Unless the context specifically indicates otherwise, the meanings of words and terms used in this chapter shall be as set forth in S.C. Code § 48-14-20 and 26, and South Carolina Land Resources Conservation Commission Regulation 72-301, mutatis mutandis.
(b) The following words, terms and phrases, when used in this chapter, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:
Adverse impact is any modifications, alterations or effects on a feature or characteristics of community lands, water, beaches or wetlands, including their quality, quantity, hydrodynamics, surface area, species or natural uses, which are or may potentially be harmful or injurious to human health, welfare, safety or property, to biological productivity, diversity or stability, or which unreasonably interfere with the enjoyment of life or property, including outdoor recreation. The term includes secondary and cumulative as well as direct impacts.
Apartment building means a structure with three or more dwelling units on a single parcel of land where the land and units are under the same ownership.
Applicant is the record owner, or authorized representative, of a tract of land that is the site of development or development activity within the scope of this chapter.
City engineer means the duly designated staff person of the department of public works designated to perform the duties as specified in this chapter, or his duly authorized agent.
Commercial property means any site not exclusively residential as defined herein, including, but not limited to, hotels, motels, and apartment buildings or other rental properties.
Condominium means a structure with multiple dwelling units, each of which is under separate ownership, on a single parcel of land, where the owners share in common ownership of the common areas in the development. Condominiums can be owner occupied or non-owner occupied rental units.
Construction project means the building or assembly of any structure on a site or sites.
Demolition means the tearing-down of buildings and other structures.
Detention is the collection and storage of stormwater runoff in a surface or subsurface facility for subsequent controlled discharge to a watercourse or waterbody.
Developer means any person who engages in development either in his own behalf or as the agency of an owner of property.
Development or *development activity* is any activity that meets the applicability criteria of section 18-21 and includes the following:
(1) The construction, installation, demolition or removal of a structure, impervious surface or drainage facility;
(2) Clearing, scraping, grubbing, killing or otherwise removing the vegetation from a site;
(3) Adding, removing, exposing, excavating, leveling, grading, digging, burrowing, dumping, piling, dredging or otherwise significantly disturbing the soil, mud, sand or rock of a site.
Director of public works means the duly designated director of the department of public works of the City of Myrtle Beach.
Drainage facility means any component of the drainage system.
Drainage system is the system through which water flows from the land. It includes all closed piped structures, watercourses, waterbodies and wetlands.
Duplex means two dwelling units that are attached either vertically or horizontally.
Easement means a grant or reservation by the owner of land for the use of such land by others for a specific purpose, and which will run with the land and be binding on all successors, heirs, and assigns.
Equivalent residential unit (ERU) means the average impervious area of a representative sample of all developed residential properties in the single family residential category. The equivalent residential unit is 5,000 square feet of impervious surface area.
Erosion is the wearing or washing away of soil by the action of wind or water.
Final stabilization means a uniform perennial vegetative cover with a density of 70 percent of native background vegetative cover established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures such as riprap or geotextiles have been employed.
Flood is a temporary rise in the level of any waterbody, watercourse or wetland that results in the inundation of areas not ordinarily covered by water.
Hydrograph means a graph or discharge versus time for a selected outfall point.
Illicit discharge means any discharge to a municipals separate storm sewer or surface water that is not composed entirely of storm water except discharges pursuant to an NPDES permit (other than the NPDES permit for discharges from the municipal separate storm sewer) and discharges resulting from fire fighting activities.

Impervious surface means a surface that has been compacted or covered with a layer of material so that it is highly resistant to infiltration by water. The term includes most conventionally surfaced streets, roofs, sidewalks, parking lots and other similar structures.
Key outfall means any outfall to the Atlantic Intracoastal Waterway from the jurisdictional city limit, any accessible major outfalls to the Atlantic Ocean, or any additional outfall determined to be significant by city personnel due to a waterbody or watercourse being placed on the 303(d) Impaired Water list.
Land disturbing activity means any use of the land by any person that results in a change in the natural cover or topography that may cause erosion and contribute to sediment and alter the quality and quantity of stormwater runoff.
Letter of acceptance means a written contract made by city personnel to accept the dedication of a stormwater drainage system for operation and maintenance purposes, and provides confirmed city ownership of fee simple titles or drainage easement access where appropriate.
Letter of agreement means a written notification of the willingness of the city to accept the operation and maintenance of a stormwater drainage system and a pledge by the property owner to grant drainage easements and/or fee simple titles of ownership to the city where appropriate.
Major municipal separate storm sewer outfall (or major outfall) means a municipal separate storm sewer outfall that discharges from a single pipe with an inside diameter of 36 inches or more or its equivalent (discharge from a single conveyance other than circular pipe which is associated with a drainage area of more than 50 acres); or for municipal separate storm sewers that receive storm water from lands zoned for industrial activity an outfall that discharges from a single pipe with an inside diameter of 12 inches or more or its equivalent (discharge from other than a circular pipe associated with a drainage area of two acres or more).
Mobile home means a dwelling unit built on axles that can be transported.
Mobile home park means a single parcel of land in which spaces are leased to mobile home owners; the owner of the land may also own and lease mobile homes on the parcel of land.
Municipal separate storm sewer system (MS4) means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):
(1) Owned by the City of Myrtle Beach;
(2) Designed or used for the collecting or conveying of stormwater; and
(3) Which is not a combined sewer.
Natural systems means systems which predominantly consist of or use those communities of plants, animals, bacteria and other flora and fauna which naturally occur on the land, in the soil or in the water.
Non-compliance means a violation that meets one or more of the following criteria:
(1) Failure to act in accordance with the parameters set forth in the written notice of violation, which states the nature of the violation and provides a reasonable time limit for the satisfactory correction thereof.
(2) Unless a particular land disturbing activity is exempt by Standards of Stormwater Management and Sediment Reduction Regulation 72-302 "Exemptions, Waivers and Variances from Law", undertaking a land disturbing activity without an approved stormwater management and sediment control plan that meets or exceeds standards identified in Standards of Stormwater Management and Sediment Reduction Regulation 72-305 "Permit Application and Approval Process" and 72-307 "Specific Design Criteria, Minimum Standards, and Specifications".
(3) Failure to be in compliance with the NPDES General Permit for Stormwater Discharges from Large and Small Construction Activities [Permit No.: SCR100000].
(4) Failure to be in compliance with the NPDES General Permit for Stormwater Discharges from Regulated Small Municipal Separate Storm Sewer Systems (MS4s) [Permit No.: SCR030000].
(5) Failure to be consistent with the South Carolina Department of Health and Environmental Control Office of Ocean and Coastal Resource Management's (SCDHEC-OCRM's) Coastal Zone Management Plan [Coastal Zone Management Act, South Carolina State Law, Title 48, Chapter 39] Stormwater Management Guidelines.
NPDES means the national pollutant discharge elimination system as defined in section 402 of the Federal Water Pollution Act and any subsequent amendment thereto; amendments of 1972 (Public Law 92-500).
Outfall is a point at which the drainage terminates and water is released into another conveyance.
Owner is the person in who is vested the fee ownership, dominion or title of property, i.e., the proprietor. This term may also include a tenant, if chargeable under his lease for the maintenance of the property, and any agent of the owner of tenant including a developer.
Person responsible for land disturbing activity means:
(1) The person who has or represents having financial or operational control over the land disturbing activity; and/or
(2) The owner or person in possession or control of the land who directly or indirectly allowed the land disturbing activity or who has benefited from it or who has failed to comply with any provision of this chapter.
Predevelopment conditions are those natural conditions that existed prior to any development as defined above.
Post construction conditions are those conditions that exist after any development or redevelopment takes place and the site or sites achieve final stabilization.
Receiving bodies of water shall mean any waterbodies, watercourses or wetlands into which surface waters flow.

Release rate is the volume of water passing off a site in a given period of time.
Residential property means any site developed exclusively for residential purposes, including single family homes, mobile homes, duplexes, townhouses, and owner occupied condominiums.
Retention refers to the collection and storage of runoff without subsequent discharge to surface waters except as may be added through overflow.
Sediment is solid material, whether mineral or organic, that is in suspension, is being transported, or has moved from its site of origin by air, water or gravity.
Site means any tract, lot or parcel of land or combination of tracts, lots or parcels of land which are in one ownership where development is to be performed as part of a unit, subdivision or project or in the case of multiple lot or area stormwater plans all of the individual properties contributing stormwater to the area system.
Stormwater means any flow occurring during or immediately following any form or natural precipitation and resulting therefrom.
Stormwater management facilities mean those structures or facilities that are designed for the collection, conveyance, storage, detention, treatment, and disposal of stormwater runoff into and through the drainage system.
Stormwater management fee means the monthly monetary amount charged to an owner of real property for the services provided by the stormwater management program.
Stormwater management and sediment control plan refers to the detailed analysis required by article II for activities described in section 18-21. The plan includes quantity and quality components.
Stormwater management program means the program established for the purposes of planning, designing, maintaining and financing stormwater management, sediment control, and flood control programs and projects.
Structure means anything constructed, installed or portable, the use of which requires a location on a parcel of land.
Subdivision is the use of land defined in the subdivision regulations of the city.
Swale is an open drainage conveyance with side slopes not greater than 17 percent and maximum depth not to exceed 12 inches.
Townhouse means a dwelling unit where the owner has interest in the land beneath the dwelling unit and may share in common ownership of the common areas in the development.
Vegetation means all plant growth, especially trees, shrubs, vines, ferns, mosses and grasses.
Water quality means those characteristics of stormwater runoff from a land disturbing activity that relate to the physical, chemical, biological, or radiological integrity of water.
Water quantity means those characteristics of stormwater runoff that relate to the rate and volume of stormwater runoff to downstream areas resulting from land disturbing activities.
Waterbody means any natural or artificial pond, lake, reservoir, ocean, swash or other area which ordinarily or intermittently contains water and which has a discernible shoreline.
Watercourse means any natural or artificial stream, river, creek, channel, ditch, canal, conduit, culvert, drain, waterway, gully, ravine, street, roadway, swale or wash in which water flows in a definite direction, either continuously or intermittently, and which has a definite channel, bed or banks, and shall include any adjacent area which is subject to flooding.
Watershed means the drainage area contributing stormwater runoff to a single point.
Watershed master plan means a plan for a designated watershed that analyzes the impact of existing and future land uses and land disturbing activities in the entire watershed and includes strategies to reduce nonpoint source pollution, to manage stormwater runoff and control flooding.
Wetlands means those areas where:
(1) The soil is ordinarily saturated with water or flooded seasonally or having a water table within six inches of the ground surface at least three months of the year.
(2) Wetlands vegetation is the dominant plant community.
(Ord. No. 2007-51, 8-14-07)

Sec. 18-4. Interpretation.
In interpreting and applying the provisions of this chapter, the provisions shall be held to be minimum requirements necessary to uphold the purpose of this chapter. It is not intended by this chapter to interfere with or abrogate or annul any easements, covenants or other agreements between parties; provided, however, where this chapter imposes greater restriction on the subdivision and/or use of buildings or land, or requires more open space or more stringent development standards than required by other resolutions, ordinances, rules or regulations, or by easements, covenants, or agreements, the provisions of this chapter shall govern. When the provisions of any other statute require more restrictive standards than are required by the regulations of this chapter, the provisions of such statute shall govern.
(Ord. No. 2007-51, 8-14-07)

Sec. 18-5. Prohibition of non-stormwater discharges into stormwater management facilities or waters of the state.

(a) *Prohibitions.* No person shall discharge or cause to be discharged into the city stormwater management facilities or waters of the state any of the following:
(1) *Oils and grease.*
(2) *Explosive mixtures.* Pollutants that create a fire or explosion hazard. Prohibited materials include, but are not limited to, gasoline, kerosene, naphtha, benzene, toluene, xylene, ethers, alcohols, ketones, aldehydes, peroxides, chlorates, perchlorates, bromates, carbides, hydrides and sulfides.
(3) *Noxious material.* Noxious or malodorous solids, liquids or gases which, either singly or by interaction with other chemicals, are capable of creating a public nuisance or hazard to life, or may prevent entry into a storm sewer for its maintenance and repair.
(4) *Garbage.* Garbage is any commercial our household debris not natural to the stormwater system, which will or may cause obstruction to the flow in a storm sewer, or other interference with the proper operation of the stormwater management facilities. Prohibited materials include, but are not limited to, appliances, shopping carts, bags of household garbage and/or yard waste, tires, bicycles, construction materials, and similar materials.
(5) *Solid or floatable waste.* Solid or floatable discharges which will or may cause interference with the proper operation of the stormwater management facilities. Prohibited materials include, but are not limited to, grease, garbage, animal feces, ashes, cinders, sand, spent limestone or marble dust, metal, glass, straw, shavings, grass clippings, rags, spent grains, spent hops, wastepaper, wood, plastic, tar, asphalt residues, residues from refining or processing of fuel or lubricating oil, and similar substances.
(6) *Excessive discharge rate.* Stormwater discharged at a flow rate, which is excessive relative to the capacity of the approved stormwater discharge rate for a site.
(7) *Heavy metals and toxic substances materials.* No heavy metals or toxic materials shall be discharged into storm sewers.
(8) *Discolored materials.* Discharges with objectionable color not native to the stormwater management facility.
(9) *Odorous materials.* Discharges with objectionable odor not native to the stormwater management facility.
(10) *Corrosive wastes.* Any waste which will cause corrosion or deterioration of the stormwater management facilities. Prohibited materials include, but are not limited to, acids, sulfides, concentrated chloride and fluoride compounds and substances which will react with water to form acidic products.
(11) *Heat.* No person shall discharge heated waste of any nature that may interfere with the proper operation of the stormwater management facilities.
(12) *Swimming pool discharges.* Swimming pool discharges containing harmful levels of chlorine or other chemicals that exceeds SCDHEC approved standards; filter backwash, algae or harmful bacteria, or any debris/vegetation are prohibited.
(b) *Non-stormwater discharges that are deemed to be exempt include:*
(1) Water line flushing;
(2) Diverted stream flows;
(3) Rising ground waters;
(4) Uncontaminated groundwater infiltration;
(5) Uncontaminated pumped groundwater;
(6) Discharges from potable water sources;
(7) Foundation drains;
(8) Air conditioning condensate;
(9) Irrigation water;
(10) Springs;
(11) Water from crawl space pumps;
(12) Individual residential car washing;
(13) Natural flows from riparian habitats and wetlands;
(14) Swimming pool discharges containing no harmful levels of chlorine or other chemicals that exceed SCDHEC approved standards and discharges must be under controlled release as to not cause erosion;
(15) Street wash water;
(16) Discharges or flows from fire fighting and emergency management activities; and
(17) Approved occasional incidental non-stormwater discharges, including, but not limited to, charity vehicle and watercraft wash events.
a. Attempt to prevent wash water from entering local closed drainage system if the charity wash event occurs on a paved surface;
b. Suggest use of biodegradable, phosphate-free environmentally friendly detergents for washing; and
c. Use hoses with nozzles that automatically turn off when left unattended.
(Ord. No. 2007-51, 8-14-07)

Sec. 18-6. Illicit discharge detection and elimination program.

The NPDES General Permit for Stormwater Discharges from Regulated Small Municipal Separate Storm Sewer Systems (MS4s) requires that MS4s develop, implement and enforce a program to detect an eliminate illicit discharges as defined in South Carolina Water Pollution Control Permits Regulation 61-9 122.26(b)(2).
The illicit discharge detection and elimination program will be administered by the director of public works or his duly authorized agent. The effective date of implementation of the illicit discharge detection and elimination program will be immediate upon adoption of this chapter.
(1) *Priority areas:* The city will evaluate all key outfalls located within the city. Key outfalls refer to any outfall to the Atlantic Intracoastal Waterway from the jurisdictional city limit, any accessible major outfall to the Atlantic Ocean, or any additional outfall determined to be significant by city personnel due to a waterbody or watercourse being placed on the 303(d) Impaired water list. Key outfalls will be inspected semi-annually for evidence of potential illicit discharge activities.
(2) *Field inspections:* Illicit discharge field inspections will be scheduled and unscheduled. The Illicit Discharge Detection and Elimination Manual will serve as guidance when city personnel perform the illicit discharge inspections.
Because of public health duties and under general police power to address public health concerns arising from illicit discharge, city personnel may enter and inspect. Upon request, property owners shall disarm security systems and remove obstructions for safe and easy access to the property.
(3) *Removal or correcting an illicit discharge:* Once the source of the discharge is identified the discharge must be removed from the system, or terminated. The city will determine who is responsible for repairs (physical and environmental) to the drainage system. If the responsible party is the city, then a work order will be issued and completed within a timely manner. If the responsible party is a private property owner, then a written notice of correction will be distributed. Non-compliance with the notice of correction will prompt enforcement measures and penalties in accordance with the city stormwater ordinance, section 18-44 "Enforcement" and section 18-45 "Penalties".
(4) *Emergency spill response:* Emergency spill responses will be coordinated with the city public works; police, and fire departments. The Standard Operating Guidelines (EMER-7) from the fire department will be the governing procedural document for emergency spills.
(Ord. No. 2007-51, 8-14-07)

ARTICLE II. CONSTRUCTION PLAN REQUIREMENTS AND STANDARDS AND POST CONSTRUCTION STORMWATER RUNOFF CONTROL REQUIREMENTS

Sec. 18-21. Applicability.
Any person, unless otherwise exempted in section 18-22, shall have an approved stormwater management and sediment control plan when applying to the city for approval for any construction or reconstruction of the site or any structures on the site (excluding signs); to change the use of land; to construct a new structure; to subdivide land; to alter any shoreline; or to perform any activity which will alter or disrupt the drainage characteristics of a site.
Further:
No person may build any structures or modify the property in any manner such that it backs up stormwater on another property or changes the flow of water onto or off of another property.
No person may discharge stormwater off their property in a different location, different volumes, or at different rates of flow such that other property, developed or undeveloped, is negatively impacted.
No person may remove stormwater management and sediment control measures until a demolition site or construction site achieves final stabilization.
An approved stormwater management and sediment control plan must be in compliance with the following, except as modified by more stringent requirements of this chapter:
(1) Standards of Stormwater Management and Sediment Reduction Regulation 72-305 "Permit Application and Approval Process" and 72-307 "Specific Design Criteria, Minimum Standards, and Specifications".
(2) NPDES General Permit for Stormwater Discharges from Large and Small Construction Activities [Permit No.: SCR100000].
(3) NPDES General Permit for Stormwater Discharges from Regulated Small Municipal Separate Storm Sewer Systems (MS4s) [Permit No.: SCR030000].
(4) Coastal Zone Management Plan [Coastal Zone Management Act, South Carolina State Law, Title 48, Chapter 39] Stormwater Management Guidelines:
Those construction plans, construction activities, and post-construction activities found to be non-compliant with the criteria set forth in this chapter are subjected to enforcement and penalties described in sections 18-44 and 18-45, respectively.
(Ord. No. 2007-51, 8-14-07)

Sec. 18-22. Exemptions.
The following activities may be exempt from the requirements of this chapter when it is determined by the public works director or his designee that no adverse impact is created:

(1) Maintenance, alteration, renewal, use or improvements to an existing drainage structure.
(2) The construction or renovation of single family dwellings and duplexes and accessory structures in the single family residential zoning districts upon determination by the engineering division that such construction meets each of the following conditions:
a. The development does not exceed two dwelling units.
b. The development is considered within a master stormwater management and sediment control plan.
c. All approved erosion and sediment control structures will be installed and remain in place during the construction phase of the single family dwelling, duplex, or accessory structures.
d. Provisions of section 18-24(h) shall be met.
(3) Agricultural and forestry pursuits.
(4) Where discharge is to a preapproved stormwater management system operated by the city in which case only a drainage plan and a soil erosion plan will be required.
(Ord. No. 2007-51, 8-14-07)

Sec. 18-23. Responsibility of applicant.
(a) It is the responsibility of the applicant to include sufficient information in the stormwater management and sediment control plan to enable evaluation of the environmental qualities of the affected area, the potential and predicted impacts of the proposed activity of affected waters, and the effectiveness and acceptability of the measures proposed by the applicant for preventing or reducing adverse impacts. The plan shall contain as appropriate, maps, charts, graphs, tables, photographs, narrative descriptions, explanations and citations to supporting references. All maps and photos shall be at a scale appropriate to assess the projects.
(b) The stormwater management and sediment control plan shall be prepared and certified by a professional engineer registered in the state, a registered landscape architect, or Tier B Land Surveyor, where appropriate, for all development activities subject to this chapter. The preparer shall certify that all approved land disturbing activities will be accomplished pursuant to the approved stormwater management and sediment control plan and that responsible personnel will be assigned to the project. Five copies of the stormwater management and sediment control plan shall be filed with the construction services department.
(c) The stormwater management and sediment control plan shall contain acknowledgement by the person responsible for the land disturbing activity of the right of regulatory agencies to perform on-site inspections.
(d) The applicant acknowledges that approved stormwater management and sediment control plans remain valid throughout the duration of the project under the following conditions:
Minor plan amendments are permitted on the project site with the requirement that notations of the amended action(s) be written, signed, and dated by all parties involved on the onsite copy of the plans. City inspectors must be notified of the minor plan amendment(s) upon their next site visit.
Major design modifications to the plans are not permitted without the approval of the stormwater management and sediment control plans preparer, and city staff must perform a formal review of the design modifications.
(e) It is the responsibility of the applicant to comply with all construction general permit regulatory obligations stated within NPDES General Permit for Stormwater Discharges from Large and Small Construction Activities [Permit No.: SCR100000] and NPDES General Permit for Stormwater Discharges from Regulated Small Municipal Separate Storm Sewer Systems (MS4s) [Permit No.: SCR30000].
(f) The applicant must submit a $5,000.00 minimum bond for sites up to one-half acre. For sites greater than one-half acre, an additional $1,000.00 per tenth of an acre bond will be required prior to issuance of a demolition to ensure final stabilization is achieved on the site prior to project termination.
(Ord. No. 2007-51, 8-14-07)

Sec. 18-24. Required information, standards.
(a) *Legal and institutional.* The following legal and institutional information shall be required for a stormwater management and sediment control plan:
(1) The name, address and telephone number of applicant and the owner, if different from the applicant.
(2) Name and address of the professional engineer, landscape architect, or Tier B land surveyor.
(3) Identify entity responsible for operation and maintenance of the system, including those areas to be dedicated or deeded as public.
(4) If the operation and maintenance of the system is to be the responsibility of the City of Myrtle Beach a willingness to accept letter of agreement from the public works director or his designee is required prior to construction.
Once construction of the system is complete, all site inspections are satisfactory, and as-built drawings are submitted and approved by city personnel, a final letter of acceptance from the public works director or his designee and a deed of conveyance are required prior to the issuance of the certificate of occupancy.

(b) *Existing environmental and hydrologic conditions.* The existing environmental and hydrologic conditions of the predeveloped site along the receiving waters and wetlands shall be described in detail and mapped, including the following:
(1) Detailed location sketch showing the parcel, roads, waterbodies and existing drainage patterns showing the direction of flow.
(2) Topographic map of the site with contour intervals at a scale adequate to assess drainage patterns in detail. Generally, one-foot contours on sites of less than two acres are required.
(3) Location and identification of all areas on the site where surface water collects.
(4) Identification of soils characteristics of the site indicating seasonal water table elevations and general soils suitability particularly where ponding or infiltration will occur.
(5) Location and identification of vegetation cover, soils characteristics, dunes and wetlands at a scale of 1" = 200' or less if necessary to describe critical areas.
(6) A description of all watercourses, waterbodies, wetlands or dunes on or adjacent to the site or into which surface waters flow or which might be adversely affected by the proposed development with names and addresses of owners of these facilities.
(7) Location of 100-year floodplain.
(8) Federal Emergency Management Agency flood map and Federal and State wetland maps, where appropriate.
(9) Existing lowest floor elevations where applicable.
(10) Any above and below grade structures.
(c) *Proposed environmental and hydrologic conditions.* The environmental and hydrologic conditions of the site after development shall be described in adequate detail and mapped, including the following:
(1) Paving, grading and drainage plans along with locations and sizes of roads and buildings (including all above and below grade structures) and their proposed elevations including special delineation of areas where impervious surfaces will be located and where percolation, infiltration, detention or retention is expected to occur.
(2) A description of those management practices to be used on the site to control stormwater runoff and erosion.
(3) Rights-of-way and easement locations for the drainage system, including any areas to be dedicated for public stormwater management purposes.
(4) Drainage basin boundaries on a map at a scale of 1" = 200' showing direction of flow and showing offsite runoff through or around the site and general land uses or designations of property in the basin.
(5) How future land uses in the land use plan could affect the project.
(6) Plans for maintenance requirements for the drainage system to maintain its proper design function and to prevent the area from creating a mosquito or odor nuisance.
(d) *Calculations.*
(1) Predevelopment and proposed hydrographs, flow rates and volumes of design storm runoffs at the point where the stormwater leaves the site for the design storm.
(2) Acreage and percentage of property proposed as: impervious surfaces; pervious surfaces (natural); pervious surfaces (porous materials); lakes, canals, channels, detention areas, retention areas; total acreage of projects; and other.
(e) *Impact analysis.* A description and analysis of the predicted impacts of the development including the impact of the stormwater management and sediment control plan on:
(1) Surface water quality on the runoff.
(2) Upstream and downstream stormwater facilities.
(3) Erosion, aesthetics and water quality of oceanfront beach areas.
(4) Water quality of the Intracoastal Waterway as a drinking water source.
(5) The existing stormwater conveyance system, including any necessary improvements to the system to accommodate the proposed flows without creating adverse impacts.
(6) Onsite water elevations for the 100-year, 24-hour storm.
(f) *Soil erosion and sediment control plan.* Proper erosion control measures are required on each construction site such that soil or sand will not be transported off the property by stormwater runoff. A soil erosion and sediment control plan shall be prepared and submitted as part of the stormwater management and sediment control plan. This plan will be included in and be a part of the final approved project drawings and will be kept on the construction site. The purpose of the soil erosion and sediment control plan is to provide measures to control erosion and sedimentation generated by removal of ground surface cover.
(1) *Soil erosion and sediment control plan guidelines.*
a. Slopes should be protected from erosion by quick establishment of vegetative cover, benches or terraces, slope protection structures, mulches, or a combination of these practices as required. It is hereby recommended that Pensacola Bahia or other rapid root development grasses be utilized as a permanent vegetative cover.
b. Drainage channels should be designed to avoid erosion problems. Wide channels with flat side slopes lined with grass or other vegetation shall be utilized where feasible. Where channel gradients are steep, concrete linings or grade control structures, such as stone check dams, may be required. Every effort should be made to preserve natural channels.

c. Sediment basins shall be constructed to discharge stormwater runoff while trapping sediment loads. Sediment basins may either be temporary or permanent, as required by the city engineer, and be designed with 80 percent total suspended solids removal efficiency.
d. Detention basins may also be used to trap sediment during and after development. Where used for this purpose, the basin shall continue to detain stormwater in accordance with the hydraulic design criteria, but allow for the settlement and containment of sediment in the basin. Sediment shall be removed periodically to ensure the intended performance of the detention basin.
e. Existing vegetation, adequate to control erosion, shall be preserved. Regeneration of wood plants shall be encouraged.
f. Silt fences or other measures may be placed around storm sewer inlets and at the boundaries of disturbed areas to trap sediment on site.
g. Other measures specifically approved by the city engineer or engineering division personnel.
(2) *Contents of soil erosion and sediment control plan.*
a. Location, scope and manner of performing temporary and permanent erosion control measures;
b. Procedures shall provide that all sediment and erosion controls are inspected at least once every 7-calendar days or at least once every 14-calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater;
c. Proposed construction sequence and time schedule for all earth-disturbing activities and installation of provisions for erosion and sediment control and stormwater management; and
d. Design computations and applicable assumptions for all structural measures for erosion and sediment control. Volume and velocity must be given for all surface water conveyance measures and pipe discharges.
(g) *Permanent flow control design standards.*
(1) The peak rate of discharge from a site after the proposed development or redevelopment shall approximate the peak rate of discharge from the site prior to development or redevelopment and shall not exceed the latter for 25-year-frequency, 24-hour duration storms. In addition, the cumulative impact of the outflow hydrograph on downstream flows shall be considered. Runoff rates in excess of predevelopment rates shall be accommodated in an approved manner on site.
(2) The volume of runoff from a site after development or redevelopment shall approximate the volume of runoff from the site prior to development or redevelopment and shall not exceed the latter volume for a 25-year-frequency storm unless the intent of this provision will be met through detention of the difference between said volumes, in which case said volume differences may be released over not less than a 24-hour period of time nor more than 72 hours.
(3) As a minimum the first inch of rainfall from each storm over the developed portion of the site shall be retained on site. For soil conditions or groundwater table conditions, which do not permit the percolation of this volume within the five days following a storm event, the city engineer may approve detention with filtration systems in lieu of retention.
(4) Channeling runoff directly on the beach shall be prohibited.
(5) Runoff from higher adjacent or upstream offsite lands shall be considered and provision for such runoff shall be included.
(6) Water shall be released into watercourses and wetlands at a rate and in a manner approximating the natural flow that would have occurred before development and outflows shall be designed to minimize erosion.
(7) Vegetated buffer strips shall be created and/or preferably retained in their natural state along the banks of all watercourses, waterbodies or wetlands. The buffer shall be wide enough to allow for periodic flooding, provide access to the waterbody and act as a filter to trap sediment in runoff.
(8) The use of drainage facilities and vegetated buffer strips as open space, recreation and conservation areas shall be encouraged.
(9) No direct connections shall be permitted between roof drains and the offsite storm sewer system. Water should be routed through stormwater management facilities.
(10) The city engineer may require such data as he determines necessary from the applicant to prove the adequacy of the design of the stormwater system.
(11) The hydrologic requirements for sites over two acres in size, mandated by this chapter, shall be developed in accordance with the latest releases and revisions of the U.S. Department of Agriculture, Soil Conservation Services' Technical Release No. 55, entitled "Urban Hydrology for Small Watersheds," and SCS National Engineering Handbook, Section 4, entitled "Hydrology." Sites two acres or less may be assessed by the Rational Method.
(12) If an identified storm drainage basin is master planned for discharging storm water to the Atlantic Ocean or Atlantic Intracoastal Waterway, conditions may be met to waive the requirement for retention and/or detention as follows: During a 25-year, 24-hour rainfall event, if the discharge structure and the internal collection system can transport the total amount of run-off from impervious surface areas that do not exceed 90 percent of the total surface area for the run-off basin, then the city may waive the quantity requirements of this section provided that the quality standards set for the basin are met through the use of Best Management Practices (BMP) accepted by OOCRM and the city. The city's waiver of the quantity requirements must be approved by the OOCRM. If the basin discharges to the Atlantic Ocean, direct discharge over the tidal beach will not be allowed. For the purpose of this section, BMP is a structural or nonstructural device designed

specifically to improve the quality of stormwater runoff. OCRM means the Office of Ocean and Coastal Resource Management and is a division of the South Carolina Department of Health and Environmental Control with regulatory authority over receiving bodies of water.
(h) *Single family and duplex residences.*
(1) A permit application for a single family house or duplex shall include a site development drawing containing the following features:
a. Tax map number, subdivision name and lot and block number.
b. A site development map to scale (1 inch = 20 feet or larger). Survey data should be on this map or on a separate attached map.
c. Elevation of the center of the road, all property corners, at 25-feet intervals along and 5-feet beyond each property line, and at any distinguishing feature on or off site that could in any way impact stormwater flow from the property.
d. Any existing and proposed watercourse, wetland, ditches, swales, pipes, culverts, catch basins, etc.
e. Proposed house foot print and finished floor elevation, including proposed ground elevations at house corners.
f. Footprints and elevations of any swimming pools, spas, decks, driveways, etc.
g. Any fence location and type of construction.
h. Include drainage flow direction arrows.
i. Roof downspouts and associated piping.
j. Adjacent roads, ditches, pipelines and culverts.
(2) The public works director or his designee may waive any of the above requirements at its sole discretion.
(3) The public works department reserves the right to perform an onsite visit to all construction sites of single-family homes and duplexes prior to plan review and approval.
(Ord. No. 2007-51, 8-14-07)

Sec. 18-25. Responsibility for maintenance.
(a) The applicant engaged in or conducting the development activity shall be responsible for maintaining all temporary stormwater runoff control measures and facilities during the development of a site.
(b) The responsibility for maintaining all permanent runoff control measures and facilities after site development is completed shall lie with the landowner unless a facility is officially accepted by the city for city maintenance. That will be allowed only when the system is part of a subdivision, a multiple lot or area plan, or when the improvements are completely contained in a dedicated right-of-way.
(c) Sufficient inspection shall be made to ensure compliance with the specifications set forth in this chapter. A registered engineer, employed by the developer, shall certify in writing to the city that he has inspected each phase of the construction of the storm drainage improvements required in this chapter. The city, however, shall make a final inspection of said improvements before accepting any such improvements for dedication to the city for permanent maintenance.
(c) Once installed and inspected, the stormwater control facilities shall be maintained in one of the following ways and approved as part of the stormwater management and sediment control plan:
(1) *Facilities maintained by owner.* The system(s) to be maintained by the owner shall provide adequate access to permit the city to inspect and, if necessary, to take corrective action. Should the owner fail to properly maintain the system(s) under his responsibility, the city shall give such owner written notice of the nature of the corrective action necessary. Should the owner fail, within 30 days from the date of the notice, to take, or commence taking, corrective action to the satisfaction of the city, the city may enter upon lands, take corrective action and place a lien on the property of the owner for the costs thereof or enter into condemnation proceedings. For purposes of this section, the term "owner" shall also mean "homeowner association" or other collective member organizations.
(2) *Facilities maintained by the city.* All areas and/or structures to be maintained by the city must be designed and constructed consistent with the requirements of this chapter and dedicated to the city by deed with attached record drawings and a one-year warranty for defects in materials and workmanship.
A letter of credit or a maintenance bond shall be provided to the city in an amount equivalent to ten percent of the cost of the improvements dedicated to the city. Such letter of credit or maintenance bond shall be held by the city for a one-year period following dedication of said improvements to the city.
(Ord. No. 2007-51, 8-14-07)

Sec. 18-26. Drainage easements and public stormwater facility ownership.
Drainage easements for those systems or portions of systems dedicated to the city for maintenance shall be provided in accordance with the following criteria:
(1) *Underground storm sewer easement.* Where development is traversed by a drainage facility, adequate areas for storm drainage, including ponding, shall be allocated, conforming substantially with the lines of such drainage facility, and be of sufficient width to carry off storm drainage. Adequate access for maintenance and equipment will be required. For underground storm drain pipe the minimum width of the easement shall not be less than 20 feet or shall be the outside diameter of the pipe(s) plus eight feet on each side, whichever is the greater.

(2) *Open channel easement.* For minor ditches which drain into a collector or main ditch or into a piped drainage system, the width of the drainage easement shall be equal to the maximum top width plus an additional 20 feet. In all cases, those ditches in excess of three feet in depth shall be piped.
(3) *Open swale easements.* For minor swale ditches along lot lines draining a small area where street drainage is not involved and where the depth of a swale does not exceed one foot, a drainage easement not less than 15 feet in width shall be provided.
(4) *Submittal.* All storm drainage easements shall be submitted in deed form to the city for acceptance and recording.
(5) *Clearing.* The full width of all drainage easements shall be cleared as required by the city.
Systems or portions of systems dedicated to the city for maintenance that serve as a regional stormwater retention/detention facility shall be provided for in accordance with the following criteria:
(1) *Detention or retention ponds fee simple ownership.* The pond footprint and an adjacent 15-foot top of bank maintenance area shall be deeded to the city under a fee simple title.
(Ord. No. 2007-51, 8-14-07)

Sec. 18-27. Fee schedule.
A schedule of fees shall be applied toward each application. This schedule may be changed by resolution of city council and is on file in the city clerk's office.
(Ord. No. 2007-51, 8-14-07)

Sec. 18-28. Multiple lot area plans.
The city may, at its option, allow multiple lot or area stormwater management and sediment control plans. Where approved these plans will plan for all water contributory to the area but may allow for pass through for water originating outside of the area.
Permanent provisions for maintenance shall be provided and approved by the city. The city may agree to accept systems for city maintenance where suitable easements and fee simple deeds are provided. Where city maintenance is not provided each benefited lot will individually have full access to the stormwater facilities and will individually have full responsibility to provide all necessary maintenance. The city will approve suitable legal documents granting access and requiring maintenance.
Nothing in this article will preclude the city from providing multiple lot or area stormwater management systems. All minimum design standards and required information required for individual site stormwater management and sediment control plans will apply to multiple lot or area plans.
Soil erosion measures as set forth in this article will be required for each individual lot within a multiple lot or area stormwater plan.
(Ord. No. 2007-51, 8-14-07)

ARTICLE IV. STORMWATER MANAGEMENT FEE

Sec. 18-60. Title of article; statutory authority.
This article may be cited as the stormwater management fee ordinance of the city and is adopted pursuant to S.C. Code § 48-14-10 et seq., S.C. Code § 5-7-30, and South Carolina Land Resources Conservation Commission Regulations 72-300 through 72-316.
(Ord. No. 2007-51, 8-14-07)

Sec. 18-61. Stormwater management fee.
(a) The stormwater management fee shall be charged to all developed sites located within the corporate limits of the city, as they may exist from time to time.
(b) City council shall establish a fee schedule under this article, which sets forth the amounts and classifications of fees to be implemented to recover the costs of maintaining and operating the stormwater system. Fees may be changed by resolution of city council from time to time and are on file in the city clerk's office. City council shall consider, among other things, the following criteria in establishing fees:
(1) The fee system shall be apportioned on a reasonable basis with due regard for the benefits conferred. City council recognizes that these benefits, while substantial, in many cases cannot be measured directly;
(2) Design, construction, maintenance, and the overall operation of the stormwater management program shall be borne proportionately by all classifications of property owners in the city in that all will enjoy the direct and indirect benefits of an improved and well-maintained system;
(3) In establishing the fee, the following costs may be considered:
a. Stormwater management and sediment control planning and preparation of comprehensive watershed master plans for stormwater management;
b. Regular inspections of public and private stormwater management facilities during construction and operation;

c. Maintenance and improvement of stormwater management facilities that have been accepted by the city for that purpose;
d. Plan review and inspection of sediment control and stormwater management and sediment control plans, measures, and practices;
e. Retrofitting designated watersheds to reduce existing flooding problems or to improve water quality;
f. Acquisition of interests in land, including easements;
g. General administration, enforcement, billing and collection; and
h. Water quantity and water quality management, including monitoring and surveillance.
(4) Practical difficulties and limitations shall be considered in establishing, calculating, and administering such fees; and.
(c) The rate for one ERU is the standard for calculating the fee for each developed site.
(Ord. No. 2007-51, 8-14-07)

Sec. 18-62. Calculation of fee and methods of assessment.
(a) The fee is a function of the number of ERUs multiplied by the rate for one ERU.
(b) The minimum fee imposed for any developed site shall be the rate for one ERU.
(c) The fee for single family homes, mobile homes, mobile home parks, duplexes and townhouses shall be determined as follows:
(1) The fee imposed for individually metered single family homes, mobile homes, as well as duplexes and townhouses that have an individual meter for each unit shall be the rate for one ERU.
(2) The fee imposed for duplexes, townhouses, and mobile home parks served by a master meter shall be the rate for one ERU multiplied by the number of units served by the meter.
(d) The fee for apartment buildings with three or more units, and condominiums shall be determined as follows:
(1) The fee imposed for apartment buildings with three or more units, and condominiums shall be the rate for one ERU multiplied by the number of calculated ERUs. For apartment building sites with three or more units, and condominium sites, an average impervious surface area factor of 80 percent of the total area of the site has been determined for calculating the fee. The calculation of the number of ERUs shall be based on the area of the site multiplied by 0.8, and then divided by the ERU factor of 5,000 square feet.
(2) The fee imposed for individual units in apartment buildings with three or more units, and condominiums that have an individual meter for each unit shall be the rate for one ERU multiplied by the number of ERUs, divided by the number of units.
(e) The fee imposed for schools and churches shall be the rate for one ERU multiplied by the number of ERUs as calculated by measuring the actual impervious surface area of the site and dividing it by the ERU factor of 5,000 square feet.
(f) The fee for commercial sites shall be determined as follows:
(1) The fee imposed for commercial properties shall be the rate for one ERU multiplied by the number of calculated ERUs. For commercial sites, an average impervious surface area factor of 80 percent of the total area of the site has been determined for calculating the fee. The calculation of the number of ERUs shall be based on the area of the site multiplied by 0.8, and then divided by the ERU factor of 5,000 square feet.
(2) The fee imposed for individual tenants of a commercial site with multiple tenants, each of whom is served by an individual meter shall be prorated by the percentage of the total square footage of the structure occupied by the tenant.
(3) The fee imposed for an individual building on a commercial site containing multiple buildings each of which is served by an individual meter shall be prorated by the percentage of the total area of the site occupied by the building.
(Ord. No. 2007-51, 8-14-07)

Sec. 18-63. Billing of stormwater management fee.
The stormwater management fee shall be billed monthly to users. Payment schedule and discontinuance of utilities service will be governed by the relevant provisions of the current water and sewer customer service policies and procedures, a copy of which is available in the offices of the utility billing and collections division. Where a user does not have a utility account, the occupant will be billed separately on a regular cycle. Owners of vacant improved real estate will likewise be billed on a regular cycle. Where an owner does not have a utility account, any bill remaining unpaid for 30 days after mailing shall constitute a lien upon the property collectible in the same manner as taxes assessed against such property.
(Ord. No. 2007-51, 8-14-07)

Sec. 18-64. Requests for adjustment.
(a) An owner or lawful occupant obligated for payment of the stormwater management fee may request an adjustment of the fee calculated by the city engineer. Such request will most often involve the determination of the amount of impervious area on the property, but can question any element of the calculation. The request must be in writing and be filed with the director of public works.

(b) The director of public works will review the request and provide a written decision to the requestor within 30 days after receipt of the request.
(c) The request shall be made upon such forms and be accompanied by such information as the city, by written policy, shall require. The owner or occupant requesting the adjustment may be required, at his own cost, to provide supplemental information to the director of public works, including but not limited to, survey data and engineering reports approved by either a registered professional land surveyor or professional engineer. Failure to provide such information may result in denial of the adjustment request.
(d) Requests for adjustment of the impervious surface area used in calculating the fee will only be accepted from owners or occupants of nonresidential sites and must be accompanied by a site survey approved by a registered professional land surveyor.
(e) If the requestor disagrees with the decision of the director of public works, he or she may appeal that decision to the city manager in writing within 15 days of receipt of the decision. The decision of the city manager to affirm or modify the decision of the director of public works will be provided in writing within 15 days after receipt of the appeal and will be final.
(f) Any adjustment to the fee approved by the director of public works or the city manager will be applied prospectively only.
(g) No provision of this article allowing for a request for adjustment shall be deemed to suspend the due date of the fee with payment in full. Any adjustment in the fee for the person pursuing a request shall be made by refund of the amount due.
(Ord. No. 2007-51, 8-14-07)

Appendix C: Federal and State Agencies and Jurisdiction

A number of Federal and State agencies have regulatory and/or management authority over the beach. The agencies and their roles are described below.

Federal

The US Army Corps of Engineers (USACE) is responsible for providing engineering services to the US, including a major role in civil works projects in which there is a Federal interest. The regulatory mission of the USACE is to protect Federal trust resources in their authority. USACE also plays a major regulatory function through section 404 of the *Federal Water Pollution Control Act of 1972* (better known as the Clean Water Act), which authorizes the Secretary of the Army to issue permits for the discharge of dredged and fill material in and around wetlands. USACE has three main permitting mechanisms, the general permit (GP), individual permit, and nationwide permit. The USACE is responsible for reviewing applications and regulating beach nourishment activities under Section 10 of the *Rivers and Harbors Act of 1899* and Section 404 of the *Clean Water Act*. The decision to issue a permit is based on evaluation of the probable impact of the project including cumulative impacts of the activity on the public interest. USACE also maintains an emergency management responsibility through its Emergency Management Division located in Charleston. During emergencies, USACE is authorized to provide engineering and public works assistance to State government agencies.

The National Oceanic and Atmospheric Administration (NOAA) is housed within the Department of Commerce. The mission of NOAA is to protect federal trust resources, provide mapping of navigation channels, monitor and forecast weather, monitor coastal dynamics and conditions, and manage the nation's coasts. Within NOAA are the National Ocean Service and the National Marine Fisheries Service. The National Marine Fisheries Service (NMFS) implements the *Magnuson-Stevens Fishery Management Act* policies, monitors and establishes Federal catch limits, restores coastal wetlands and shellfish habitat, and assesses natural resource damages to federal trust species. NMFS has coordination authority over Federal activities and permits that may adversely affect Essential Fish Habitat (EFH), and requires notification and consultation prior to Federal permitting of certain activities, including beach nourishment. NMFS administers the requirements of the *Marine Mammal Protection Act*, and has joint responsibility with the US Fish and Wildlife Service for the protection and recovery of sea turtles. The National Ocean Service monitors coastal processes and conditions and administers the Federal Coastal Zone Management program. Section 307 of the *Coastal Zone Management Act* requires that an applicant for a Federal permit, grant, license, or approval must certify that the proposed action is consistent to the maximum extent practicable with the policies and purposes of a Federally approved State coastal management program. The State must concur with this certification prior to a Federal agency undertaking the approval, authorization, licensing or funding of the proposed project.

The US Fish and Wildlife Service (USFWS) is responsible for the protection of Federal fish and wildlife habitats and species, specifically those that are imperiled, threatened, or endangered. USFWS does not directly permit or authorize activities but is generally part of a consultation team and can elevate issues that are deemed important. USFWS is responsible for administering the *Endangered Species Act (ESA)*, which protects threatened and endangered species and habitats primarily on land and on the beaches in coastal areas. The USFWS has direct responsibility for protecting endangered insects, plants, and shorebirds, and shares joint responsibility with NMFS for the protection and recovery of sea turtles.

The Federal Emergency Management Agency (FEMA) is part of the Department of Homeland Security. FEMA advises local governments on building codes and flood plain management; helps equip local and state emergency preparedness; coordinates the Federal response to a disaster; makes disaster assistance available to states, communities, businesses, and individuals; trains emergency managers, supports the USDA Fire Service; and administers the national flood and crime insurance programs.

The US Coast Guard (USCG) is responsible for protecting the nation's waterways and coastline. The *Homeland Security Act of 2002* divided the Coast Guard's 11 statutory missions between homeland security and non-homeland security. The Guards' missions include promoting maritime safety, security and mobility, providing for national defense, and protecting natural resources. USCG performs search and rescue operations in coastal areas for missing boaters, lost swimmers, and sinking vessels. Coast Guard is also involved in law enforcement on the water, particularly reckless boating, boating while intoxicated and drug interdiction. In addition, the Coast Guard has authority over the permitting of bridges. A major responsibility of the Guard is to respond to, investigate, and address oil spills in a water body. USCG has developed an

Area Contingency Plan for each section of the State for spills and response. USCG serves as the Federal On Scene Coordinator for spills.

State

DHEC-OCRM is responsible for the management of the state's beachfront and coastal zone. In 1988, the General Assembly of the state of South Carolina amended the South Carolina Code of Laws to include the State Beachfront Management Act (Act) in the state's Coastal Tidelands and Wetlands Act (SC Code ann. §48-39-110 *et. seq.*). This amendment increased the state's authority to manage the use and preservation of ocean beaches and dunes. The Act is intended to protect both life and property, protect unique ecological habitats, and preserve the beach for future use by all citizens of South Carolina. The Act addresses preservation of a dry-sand beach, public access opportunities, measures for renourishment on eroding beaches, and the protection of natural vegetation within the beach and dune system. The Act rejects the construction of new erosion control devices and adopts retreat and renourishment as the basic state policy for preserving and restoring oceanfront beaches in South Carolina. The Act also directs DHEC-OCRM to implement the retreat policy by designating a baseline and setback line on all oceanfront properties, and develop a long-range comprehensive State plan for management of the beach and dune resources.

The SC General Assembly is the legal legislative body and as such holds significant authority over decisions of the State. The Assembly has the authority to control public lands, including bottomland and beaches below the mean high water mark, manage public trust resources, such as finfish and shellfish, and regulate the use of water bodies for various purposes including navigation. The Assembly has delegated responsibility for the management of many public trust resources to State agencies. All authority and jurisdiction assumed or acted upon by any State agency is through direct delegation of such authority from the SC General Assembly.

The SC Department of Health and Environmental Control (DHEC) is charged with protecting public health, coastal resources, and the State's land, air and water quality as authorized under multiple State and Federal laws. The Department is comprised of five deputy bureaus including Administration, Health Regulation, Health Services, Environmental Quality Control (EQC), and the Office of Coastal Resource Management (OCRM). OCRM enforces the *Coastal Zone Management Act* to protect coastal resources and promotes responsible development through permitting and certification programs. The regulatory program reviews and permits dock activities beach and dune permits, beach renourishment, wetland impacts, marina applications, and coastal storm water permitting within the eight coastal counties. The Planning Division provides assistance to local communities in identifying and addressing coastal change, prepares guidance and policy documents to assist government agencies in understanding coastal issues, and manages the preparation of local comprehensive beach management plans. EQC manages water and community wastewater permitting, stormwater permitting, septic system, public and private wells and other inspections, manages air emissions, brownfields, solid waste and hazardous waste, mining, beach monitoring, public swimming pools, and permitting activity for numerous environmental program areas.

The SC Department of Natural Resources (DNR) is the principal advocate for and steward of the State's natural resources. This is accomplished through regulating hunting, fishing and boating activities and through conservation and land and water management programs. DNR administers the State's threatened and endangered species programs, including protection of shorebirds, sea turtles and marine mammals. DNR also administers most of the State's authority for the management of surface vessels and enforcing boating regulations through the DNR Law Enforcement Division.

The SC Department of Transportation (DOT) is responsible for planning, constructing, and maintaining state roads and bridges, and providing mass transit services in the State. The Department helps plan for hurricane evacuation routes and maintains and publishes the current evacuation routes. DOT also provides emergency response during hurricanes to facilitate evacuation.

The SC Emergency Management Division (EMD) is responsible for preparing for, responding to, and assisting in recovery after major disasters, storms, and other emergencies. EMD is comprised of six divisions including the division director's office, public information, preparedness and recovery, response and operations, critical incident management group (CIMG) and administrative services. EMD provides planning assistance for communities prone to emergencies such as storms or hazards, and also provides training to responders. A Regional Emergency Management Program is housed in EMD that provides on-the-ground assistance to communities in the six EMD districts. EMD also works directly with county and local governments following storms to help facilitate rebuilding.

Appendix D: Local Beach Management Policies

Chapter 5, Sections 5-1 through 5-30 of the *Myrtle Beach Code of Ordinances* addresses beach and boating regulations including:

- Public access being defined as the area of land extending from the public street to the public beach which has been dedicated for the purpose of providing public and emergency access to the beach.
- Public beach defined as the area lying between the Atlantic Ocean and the easternmost property line of the property owned by private individuals or corporations, lying closest in proximity to the Atlantic Ocean; except that where there is a street leading east from Ocean Boulevard toward the Atlantic Ocean, and also "public beach" at these points shall mean the area lying between the easternmost edge of the public street and the Atlantic Ocean; and includes any area lying between the mean low water mark of the Atlantic Ocean and the primary dune line, bulkhead or seawall, as well as those lands subject to periodic inundation by tidal and wave actions so that no non-littoral vegetation is established.
- The role of the Beach Advisory Committee in studying issues of particular significance to the preservation and development of the beach.
- The authority of beach patrol officers and their agents as to swimmers, and persons on the beach.
- Lifeguard stands access, egress and line of sight protection.
- Regulations on recreational fishing from shore or pier.
- Certain floatation devices restricted.
- Use of bicycles restricted.
- Sailboat storage regulations.
- Watercraft operational restrictions.
- Use of kayaks and surfboards restricted.
- Launching of jet skis and motor boats restricted.
- Operation of parasailing activities regulations.
- Animals on the beach restrictions.
- Personal use of public beach structures prohibited; obstruction on the beach prohibited; and items left are considered abandoned.
- Possession or consumption of alcoholic liquors, beer or wine on the beach or beach accesses prohibited.
- Fires prohibited.
- Carrying glass containers on beaches prohibited.
- Discharge, use, ignition, etc. of fireworks prohibited.
- Sleeping on public beach or public access after 9:00 p.m. prohibited.
- Diving or jumping from piers prohibited.
- Aquatic activity within 75 yards of pier prohibited.
- Destruction of sea oats, beach grass, beach vegetation and sand fencing prohibited.
- Deposing of litter on beach or in water prohibited.
- Commercial fishing on public beaches prohibited.
- Negligent, reckless or intoxicated operation of devices (motorboat, jet ski or other vessel, skis, surfboard or similar device) or beach activities prohibited.
- Horses prohibited.
- Solicitation and commercial activities prohibited.
- Changing clothes in public, or in private (without consent of owner) restroom facilities prohibited.
- Unauthorized vehicles prohibited on the beach and emergency access lanes.
- Nudity, display of specified anatomical areas and specified sexual activities prohibited.

Zoning Ordinance, Article IX, Section 916.12 addresses light and glare and sea turtles:

- In order to prevent and minimize hazards to nesting female sea turtles and their hatchlings on the beach, the following regulations apply to the beach and property near the beach between 31st Ave N and 52nd Ave N, between Highland Ave and Canepatch Swash and between 77th Ave N and the northern boundary of the city:
    1) No exterior light source on public or private property shall be directly visible from any point seaward of the landward toe of the landward-most sand dune.

2) Except for lights regulated in the following sentence, no direct or reflected light from an exterior light source on public or private property will be visible from any point seaward of the landward toe of the landward most sand dune. For beach access points, dune walkovers, beach walkways, or any other structure designed for pedestrian traffic on or seaward of the primary dune, only low-intensity recessed or louvered lighting or other appropriate low-intensity lighting will be used;

such lighting will be turned off after 10:00 p.m. each day and not turned on again before 7:00 a.m. the next day from May 1st to October 31st each year:

3) Outdoor lighting will be held to the minimum necessary for safety and security.

4) The Director of Construction Services will provide information to property owners who wish to prevent interior light emanating from doors and windows within direct line of sight of the beach. Methods which the Director may recommend include applying window tint or film; rearranging lamps and other moveable fixtures away from windows; applying window treatments; and, during the nesting season, drawing these coverings each night; and turning off all unnecessary lights.

5) The Director of Construction Services will provide information to owners of property, especially those immediately adjacent to the area governed by this subsection, to voluntarily minimize exterior lighting that may be hazardous to sea turtles.

Article XII, Section 1244 of the *Zoning Ordinance* includes supplementary regulations for oceanfront property:

- The purpose of the CP coastal protection zone is to provide supplementary regulations for oceanfront property seaward of the projected 50 year erosion control line to control erosion, preserve and maintain a recreational beach, safeguard property and promote public safety, while acknowledging the public benefit and historic location of pier structures on deeded pier lots located approximately at 14th Ave N, 2nd Ave N and 54th Ave N. It is the intent to promote the retreat of buildings, structures and other improvements located on non-pier lots from the CP district or as far landward in the district as possible. Except for the piers on pier lots, if retreat is not possible, it is intended that existing buildings may be replaced without exceeding the gross square footage of the existing building and without any portion of the footprint of the building located in the CP district being exceeded. All property lying seaward of the building control line and extending eastward to the corporate limit of the City of Myrtle Beach are hereby designated as the coastal protection district (overlay zone). A building control line is established at the projected 50-year shoreline (50-year future dune crest). The building control line shall be located 34 feet landward and parallel to the baseline defined by the most recent baseline coordinates as provided by OCRM.

Appendix E: Beachfront Structures Inventory

Property Owner	Block	Street	Tax Map Number	Structure Inventory	Structure Distance from OCRM 40 Year Setback Line	Erosion Control Structure
Private	2917	S Ocean Blvd	1860801215	Deck	4'2"	
				Fence	11'3"	
Private	2913	S Ocean Blvd	1860801210	Fence	11'4"	
				Deck	5'8"	
Private	2807	S Ocean Blvd	1860801213	Deck	9'4"	
				Fence	9'2"	
					47'6"	Rip Rap
Private	2807	S Ocean Blvd	1860801015	Deck	10'6"	
				Fence	10'6"	
					49'4"	Rip Rap
Private	2805	S Ocean Blvd	1860801013	Deck	3'	
				Asphalt Parking	5'8"	
					6'3"	Retaining Wall
Private	2801	S Ocean Blvd	1860801012		6'9"	Retaining Wall
				Concrete Parking	7'6"	
Private	2711	S Ocean Blvd	1860801011	Asphalt Parking	12'2"	
Private	2709	S Ocean Blvd	1860801454 – 1860801489	Deck	4'2"	
				Fence	11'3"	
				Pool	3'4"	
Private	2701	S Ocean Blvd	1860801216 – 1860801453	Fence	65'	
				Deck	6'	
Private	2611	S Ocean Blvd	1860801137 – 1860801205	Deck	24'10"	
				Pool	12'1"	
				Spa	5'10"	
Private	2609	S Ocean Blvd	1860801006	Fence	40'	
Private	2605 (Holiday	S Ocean Blvd	1860801005	Sidewalk	24'	

Property Owner	Block	Street	Tax Map Number	Structure Inventory	Structure Distance from OCRM 40 Year Setback Line	Erosion Control Structure
	South)					
				Deck	33'	
				Pool	15'1"	
Private	2603	S Ocean Blvd	1860801004	Asphalt Parking	28'	
				Deck	13'2"	
				Fence	13'4"	
				Pool	6'2"	
				Wall	36'	
Private	2601	S Ocean Blvd	1860801003	Asphalt Parking	28'2"	
Private	2511	S Ocean Blvd	1860801017 – 1860801135	Wall	34'	
				Concrete	34'	
				Deck	35'	
				Pool	20'4"	
				Fence	35'	
				Enclosed Pool	32'	
Private	2411	S Ocean Blvd	1870501003	Fence	9'2"	
				Deck	9'4"	
				Habital Structure > 5000 sq ft	9'6"	
Private	2311	S Ocean Blvd	1870501006 – 1870501300	Deck	8'2"	
				Fence	8'	
				Habital Structure > 5000 sq ft	4'8"	
				Pool	3'	
Private	2311	S Ocean Blvd	1870101004	Tiki Hut	15'2"	
				Shuffle Board	21'9"	
				Deck	38'1"	
				Pool	20'	
				Fence	38'	
Private	2301	S Ocean Blvd	1870101198 and 1870101024 – 1870101124)	Lazy River Pool	22'	
				Deck	38'4"	
				Pool	20'	
				Fence	38'	

Property Owner	Block	Street	Tax Map Number	Structure Inventory	Structure Distance from OCRM 40 Year Setback Line	Erosion Control Structure
Private	2209	S Ocean Blvd	1870102009	Pool	21'6"	
				Deck	33'4"	
				Fence	33'6"	
Private	2207	S Ocean Blvd	1870102058 – 1870102299	Deck	9'	
				Fence	9'	
Private	2105	S Ocean Blvd	1870102003	Fence	27'9"	
Private	2101	S Ocean Blvd	1870102001 – 1870102002	Deck	33'2"	
				Fence	33'2"	
				Pool	22'	
				Spa/Kid's Pool	23'6"	
					38'10"	Rip Rap
Private	2001	S Ocean Blvd	1870108053 – 1870108232	Habital Structure < 5000 sq ft	5'1"	
				Deck	28'4"	
				Pool	7'	
				Fence	28'4"	
				Sidewalk	11'	
Private	2007	S Ocean Blvd	1870103155 – 1870103290	Fence	28'2"	
					51'2"	Rip Rap
Private	1903	S Ocean Blvd	1870103003	Asphalt Parking	18'	
Private	1901	S Ocean Blvd	1870103002	Deck	20'	
				Fence	15'2"	
				Pool	9'	
Private	1809	S Ocean Blvd	1870104007	Habital Structure < 5000 Sq Ft	13'4"	
				Deck	28'4"	
				Fence	26'3"	
Private	1805/1807	S Ocean Blvd	1870104005	Parking Lot	41'2"	
					41'1"	
Private	1803	S Ocean Blvd	1870104003	Deck	28'	
				Playground	28'	

Property Owner	Block	Street	Tax Map Number	Structure Inventory	Structure Distance from OCRM 40 Year Setback Line	Erosion Control Structure
				Fence	28'2"	
				Wall	28'2"	
Private	1705	S Ocean Blvd	1870104002	Fence	24'1"	
Private	1703	S Ocean Blvd	1870104001	Fence	25'2"	
Private	1701	S Ocean Blvd	1870105011	Asphalt Parking Lot	39'6"	
Private	1701	S Ocean Blvd	1870105012	Concrete Parking Lot	43'2"	
Private	1601	S Ocean Blvd	1870105024 – 1870105325	Habital Structure < 5000 Sq Ft	5'2"	
				Pool	5'9"	
				Deck	32'	
				Fence	32'2"	
				Spa	25'2"	
Private	1607	S Ocean Blvd	1870105013	Habital Structure < 5000 Sq Ft	2'	
				Deck	40'7"	
				Fence	29'	
				Pool	40'9"	
Private	1501	S Ocean Blvd	1870106162 – 1870106733	Indoor Pool > 5000 Sq Ft	26'5"	
				Pool	20'	
				Deck	43'4"	
				Fence	43'6"	
				Stair	26'	
				Ramp	26'	
Private	1405	S Ocean Blvd	1870106014	Pool	18'1"	
				Deck	34'6"	
				Fence	34'4"	
Private	1403	S Ocean Blvd	1870106015	Habital Structure < 5000 Sq Ft	3'	
				Deck	32'3"	
				Pool	23'1"	
				Fence	32'	
Private	1401	S Ocean Blvd	1870106016	Deck	33'4"	
				Pool	22'	
				Fence	33'4"	
Private	1307	S Ocean	1870106026 –	Habital Structure	9'10"	

Property Owner	Block	Street	Tax Map Number	Structure Inventory	Structure Distance from OCRM 40 Year Setback Line	Erosion Control Structure
		Blvd	1870106071	< 5000 Sq Ft		
				Deck	31'6"	
				Fence	31'6"	
				Pool	25'	
Private	1305	S Ocean Blvd	1811301001	Habital Structure < 5000 Sq Ft	6'	
				Deck	19'2"	
				Fence	19'2"	
Private	1301	S Ocean Blvd	1811301002	Habital Structure < 5000 Sq Ft	7'	
				Deck	40'	
				Fence	40'	
				Pool Bar	30'	
Private	1200	S Ocean Blvd	1811302004 – 1811302276	Habital Structure > 5000 Sq Ft	35'	
				Deck	54'2"	
				Fence	54'2"	
Private	1203	S Ocean Blvd	1811302002	Deck	36'8"	
				Fence	36'8"	
				Pool	17'10"	
Private	1201	S Ocean Blvd	1811302003	Deck	22'4"	
				Fence	22'2"	
Private	1200	S Ocean Blvd	1811302004 – 1811302276	Habital Structure < 5000 Sq Ft	39'6"	
				Deck	67"	
				Fence	67"	
Private	1100	S Ocean Blvd	1811303002 – 1811303297	Habital Structure < 5000 Sq Ft	8'6"	
				Deck	49'6"	
				Fence	49'6"	
				Spa	33'8"	
				Pool	33'8"	
				Lazy River Pool	21'	
Private	1007	S Ocean Blvd	1811401001	Habital Structure > 5000 Sq Ft	30'	
Private	1005	S Ocean Blvd	1811401002	Pool	16'6"	
				Deck	36'9"	
				Fence	36'9"	

Property Owner	Block	Street	Tax Map Number	Structure Inventory	Structure Distance from OCRM 40 Year Setback Line	Erosion Control Structure
Private	1001	S Ocean Blvd	1811401003	Habital Structure > 5000 Sq Ft	3'	
				Deck	33'	
				Pool	21'5"	
				Fence	33'	
					40'3"	Rip Rap
Private	1000	S Ocean Blvd	1811401004	Deck	41'6"	
				Pool	22'	
				Fence	41'6"	
Private	1000	S Ocean Blvd	1811401006	Habital Structure > 5000 Sq Ft	6'	
				Deck	32'7"	
				Pool	10'2"	
				Fence	32'5"	
Private	700	S Ocean Blvd	1811401032	Deck	4'6"	
				Fence	4'6"	
Private	415	S Ocean Blvd	1811402315 – 1811402479	Pool	10'6"	
				Spa	16'	
				Deck	38'	
				Fence	38'	
Private	415	S Ocean Blvd	1811402107 – 1811402162	Habital Structure > 5000 Sq Ft	2'6"	
				Deck	22'4"	
				Pool	22'4"	
				Fence	15'2"	
				Bar	6'	
				Lazy River Pool	18'2"	
				Kid's Pool	14'8"	
				Habital Structure > 5000 Sq Ft	16'4"	
				Deck	22'	
				Fence	22'	
Private	301	S Ocean Blvd	1811402011	Deck	48'	
				Fence	48'	
Private	301	S Ocean Blvd	1811402012	Habital Structure > 5000 Sq Ft	9'	
				Slide	36'10"	

Property Owner	Block	Street	Tax Map Number	Structure Inventory	Structure Distance from OCRM 40 Year Setback Line	Erosion Control Structure
				Deck	54'10"	
				Fence	54'10"	
				Concrete	54'10"	
Private	211	S Ocean Blvd	1811402016	Habital Structure > 5000 Sq Ft	29'8"	
				Deck	40'	
				Fence	40'2"	
Private	105	S Ocean Blvd	1811402028 - 1811402106	Deck	34'7"	
				Fence	34'7"	
Private	107/201	S Ocean Blvd	1811402018 – 1811402314	Pool	26'9'	
				Deck	41'4"	
				Fence	41'4"	
Private	105	S Ocean Blvd	1811044003 – 1811044142	Pool	42'	
				Deck	54'3"	
				Fence	54'3"	
				Spa	47'	
Private	100	S Ocean Blvd	1811044001	Habital Structure < 5000 Sq Ft	22'3"	
				Deck	51'	
				Fence	51'	
				Pool	37'	
Private	200 (2nd Ave Pier and Restaurant)	N Ocean Blvd	1811035001	Habital Structure < 5000 Sq Ft	104'	
				Sidewalk	5'	
Public	200	N Ocean Blvd	1811045003	Fabric Tent – City Boardwalk	21'	
Public	200	N Ocean Blvd	1811034006	Sidewalk – City Boardwalk	22'8"	
Public	300	N Ocean Blvd	1811033007	Sidewalk – City Boardwalk	23'	
Public	400	N Ocean Blvd	1811101003	Sidewalk – City Boardwalk	24'6"	
Public	500	N Ocean Blvd	1811102011	Sidewalk – City Boardwalk	23'8"	

Property Owner	Block	Street	Tax Map Number	Structure Inventory	Structure Distance from OCRM 40 Year Setback Line	Erosion Control Structure
Public	600	N Ocean Blvd	1811104010	Sidewalk – City Boardwalk	23'	
Public	700	N Ocean Blvd	1811105009	Sidewalk – City Boardwalk	22'	
Public	800	N Ocean Blvd	1810704002	City Boardwalk	22'	
Public	900	N Ocean Blvd	1810708013	City Boardwalk	26'2"	
				Fabric Tent	40'	
Public	900	N Ocean Blvd	1810708012	Fence – City Boardwalk	18'4"	
				Fabric Tent	44'	
Public	1100	N Ocean Blvd	1810717009	Fence – City Boardwalk	35'	
				Fabric Tent	48'10"	
Private	1100	N Ocean Blvd	1810717010	Parking Lot/Fence	22'2"	
Public	1100	N Ocean Blvd	1810717008	City Boardwalk	65'	
				City Boardwalk	68'	
				City Boardwalk	69'2"	
Private	1100	N Ocean Blvd	1810717006	Parking Lot/Fence	22'	
				Deck	3'	
Private	1200	S Ocean Blvd	1810717007	Deck	22'6"	
				Fence	22'8"	
Public	1200	N Ocean Blvd	1810724091	City Boardwalk	70'	
Private	1202	N Ocean Blvd	1810724092 – 1810724200	Pool	14'7"	
				Deck	30'4"	
				Fence	30'2"	
Private	1204	N Ocean Blvd	1810724002	Pool	16'	
				Deck	23'8"	
				Fence	23'8"	
				Boardwalk	63'8"	
Public	1204	N Ocean	1810724003	Sidewalk	60'	

Property Owner	Block	Street	Tax Map Number	Structure Inventory	Structure Distance from OCRM 40 Year Setback Line	Erosion Control Structure
		Blvd				
				Boardwalk	63'8"	
Private	1304	N Ocean Blvd	1810724088	Habital Structure > 5000 Sq Ft	104'4"	
Private	1304	N Ocean Blvd	1810704001 - 1810704081	Deck	29'3"	
				Fence	29'3"	
				Pool	5'	
Public	1400	N Ocean Blvd	1810724089	Boardwalk	28'1"	
Private	1404	N Ocean Blvd	1810724007- 1810724087	Pool	6'	
				Deck	19'2"	
				Fence	19'2"	
Private	1404	N Ocean Blvd	1810732005	Pool	2'	
				Deck	12'8"	
				Fence	12'6"	
Private	1406	N Ocean Blvd	1810732006	Pool	3'6"	
				Deck	12'6"	
				Fence	12'6"	
Private	1502	N Ocean Blvd	1810732007	Deck	5'	
				Fence	11'6"	
Private	1504	N Ocean Blvd	1810732008	Deck	8'	
				Fence	8'	
Private	1506	N Ocean Blvd	1810737001	Parking Lot	3'6"	
				Fence	3'6"	
Private	1700	N Ocean Blvd	1810737106 – 1810737180	Pool	2'2"	
				Fence	8'4"	
				Deck	8'4"	
Private	1702-1704	N Ocean Blvd	1810737067 – 1810737105 and 1810737181 –	Deck	3'	

Property Owner	Block	Street	Tax Map Number	Structure Inventory	Structure Distance from OCRM 40 Year Setback Line	Erosion Control Structure
			1810737238			
				Fence	3'	
				Concrete	18'	
				Deck	3'	
				Fence	2'8"	
				Concrete	18'	
Private	1704	N Ocean Blvd	1810737006	Deck	6'	
				Fence	5'10"	
				Concrete	22'	
Private	1706	N Ocean Blvd	1810737007	Deck	6'2"	
				Fence	6'2"	
				Concrete	23'5"	
				Shuffle Board	22'	
Private	1708	N Ocean Blvd	1810737008	Deck	12'4"	
				Fence	12'4"	
Private	2000	N Ocean Blvd	1810338010 – 1810338243	Deck	6'3"	
				Deck	7'	
Private	2100	N Ocean Blvd	1810418008	Concrete	6'	
Private	2502	N Ocean Blvd	1810416003	Pool	2'2"	
				Deck	18'6"	
				Asphalt	16'1"	
				Fence	18'6"	
Private	2504-2506	N Ocean Blvd	1810406112 – 1810406245	Pool	12'6"	
				Deck	24'	
				Fence	35'	
				Pool	14'	
				Deck	25'	
				Fence	25"	
Private	2600	N Ocean Blvd	1810415006 and 1810415236 - 1810415550	Pool	8'	
				Deck	20'	
				Fence	20'	

Property Owner	Block	Street	Tax Map Number	Structure Inventory	Structure Distance from OCRM 40 Year Setback Line	Erosion Control Structure
Private	2606	N Ocean Blvd	1810415004	Asphalt	13'	
				Fence	13'	
Private	2608	N Ocean Blvd	1810415003	Asphalt	25'1"	
				Fence	12'2"	
Private	2610	N Ocean Blvd	1810415002	Pool	6'6"	
				Asphalt	28'8"	
				Fence	28'8"	
				Deck	15'6"	
Private	2700	N Ocean Blvd	1810415010 – 1810415099	Fence	30'4"	
Private	2710	N Ocean Blvd	1810415100 – 1810415557	Deck	6'	
				Fence	31'9"	
Public	2800	N Ocean Blvd	1810414055	Wood Structure	6'	
		N Ocean Blvd		Concrete	16'8"	
Private	2804	N Ocean Blvd	1810414057 – 1810414094	Pool	8'10"	
				Deck	21'2"	
				Fence	21'	
Private	2806	N Ocean Blvd	1810414004 – 1810414097	Asphalt	19'3"	
				Fence	27'	
				Spa	9'	
Private	3000	N Ocean Blvd	1731624006-1731624374	Pool	19'2"	
				Deck	25'5"	
				Fence	25'3"	
					14'	Rip Rap
Private	3002	N Ocean Blvd	1731624002	Concrete Patio	25'	
				Deck	26'	
				Fence	26'	
					15'3"	Rip Rap
Private	3006	N Ocean Blvd	1731624001	Pool	25'4"	

Property Owner	Block	Street	Tax Map Number	Structure Inventory	Structure Distance from OCRM 40 Year Setback Line	Erosion Control Structure
				Deck	37'	
				Fence	37'	
					21'	Rip Rap
Private	3402	N Ocean Blvd	1741306002	Fence	23'	
Private	3702	N Ocean Blvd	1741307002	Fence	26"	
Private	3800	N Ocean Blvd	1741308001	Sidewalk	22'	
				Habital Structure > 5000 Sq Ft	42'6"	
Private	3802	N Ocean Blvd	1741308002	Deck	5'	
				Fence	31'	
Private	4204	N Ocean Blvd	1740929002	Fence	14'9"	
Private	4206	N Ocean Blvd	1740929003	Fence	20'3"	
Private	4300	N Ocean Blvd	1740928001	Fence	8'	
Private	4304	N Ocean Blvd	1740928003	Fence	7'	
				Habital Structure > 5000 Sq Ft	4'	
				Habital Structure > 5000 Sq Ft	6'	
Private	4306	N Ocean Blvd	1740928004	Fence	9'	
				Habital Structure > 5000 Sq Ft	10'	
Private	4502	N Ocean Blvd	1740926002	Habital Structure > 5000 Sq Ft	16'6"	
Private	4710	N Ocean Blvd	1740924005	Deck	11'6"	
				Fence	11'4"	
Private	4806	N Ocean Blvd	1740923004	Deck	5'6"	
				Fence	5'6"	
Private	4902	N Ocean	1741002002	Sidewalk	6'	

Property Owner	Block	Street	Tax Map Number	Structure Inventory	Structure Distance from CCRM 40 Year Setback Line	Erosion Control Structure
		Blvd				
				Fence	14'	
Private	5000	N Ocean Blvd	1741002005	Habital Structure > 5000 Sq Ft	5'4"	
				Sidewalk	14'	
				Fence	14'	
Private	5006	N Ocean Blvd	1741002008	Deck	5'2"	
Public	(Gardens by the Sea Park)	N Ocean Blvd	1740617022	Deck	23'8"	
Private	5500	N Ocean Blvd	1740617021	Habital Structure > 5000 Sq Ft	41'4"	
Private	5511	N Ocean Blvd	1740617009	Habital Structure > 5000 Sq Ft	6'5"	
Private	5710	N Ocean Blvd	1740608002	Deck	3'	
Private	5900	N Ocean Blvd	1740701018 – 1740701029	Deck	15'3"	
				Fence	15'1"	
Private	6000	N Ocean Blvd	1740701032 – 1740701182	Habital Structure > 5000 Sq Ft	18'8"	
Private	6000	N Ocean Blvd	1740701046	Pool	7'6"	
Private	6000	N Ocean Blvd	1740701107	Deck	17'	
				Fence	25'5"	
Private	6005	N Ocean Blvd	1740701008		34'	Rip Rap
Private	6006	N Ocean Blvd	1740313028	Deck	25'4"	
Private	6008	N Ocean Blvd	1740313001	Deck	20	
Private	6200	N Ocean Blvd	1740313002	Deck	19'6"	
Private	6202	N Ocean Blvd	1740313003	Fence	1'6"	

Property Owner	Block	Street	Tax Map Number	Structure Inventory	Structure Distance from OCRM 40 Year Setback Line	Erosion Control Structure
Private	6304	N Ocean Blvd	1740313009	Fence	20'8"	
Private	6306	N Ocean Blvd	1740313010	Fence	23'6"	
Private	6804	N Ocean Blvd	1740304558 – 1740304752	Gazebo	19'	
Private	6900	N Ocean Blvd	1740315001 – 1740315349	Gazebo	39'2"	
Private	7000	N Ocean Blvd	1740304333 - 1740304398	Parking Lot	26'	
				Habital Structure ≥ 5000 Sq Ft	24'	
				Pool	23'	
				Deck	33'	
				Fence	33'	
Private	7050	N Ocean Blvd	1740304028 and 1740314001 - 1740314053	Fence	32'4"	
				Deck	33'	
Private	7100	N Ocean Blvd	1740305011- 1740305729	Habital Structure ≤ 5000 Sq Ft	8'	
				Deck/Fence	21'	
Private	7200	N Ocean Blvd	1740305069 - 1740305086	Pool	13'6"	
				Deck	20'	
				Fence	20'	
Private	7200	N Ocean Blvd	1740305093 - 1740305312	Fence	50'9"	
				Deck	50'9"	
Private	201	N Ocean Blvd @ 74th Ave N	1740401342	Pool	3'8"	
				Deck	15'2"	
				Fence	15'	
				Gazebo	40'	
				Habital Structure	14'9"	
Private	201	75th Ave N @ N Ocean Blvd	1651609005	Pool	2'4'	
				Deck	20'	

Property Owner	Block	Street	Tax Map Number	Structure Inventory	Structure Distance from OCRM 40 Year Setback Line	Erosion Control Structure
				Fence	20	
				Canopy	16'2"	
				Gazebo	28'10"	
Private	200	76th Ave N @ N Ocean Blvd	1651607031 – 1651607155	Deck	9'	
				Fence	9'6"	
Private	200	77th Ave N @ N Ocean Blvd	1651607157 – 1651607296	Fence	3'	
				Deck	1'2"	
Private	7804	N Ocean Blvd	1651605010	Gazebo	10'	
				Deck	8'6"	
Private	7902	N Ocean Blvd	1651604011	Fence	19'8"	
Private	8000	N Ocean Blvd	1651603013	Concrete	5'6"	
				Fence	40'	
Private	8106	N Ocean Blvd	1651602010	Gazebo	19'	
				Sidewalk	14'	

City of Myrtle Beach
Construction Services
Dune Walkover Guidelines

The following is a guideline for permitting and constructing dune walkovers in the City limits of Myrtle Beach. Provide a completely filled out building permit application and four (4) surveys not more than six (6) months old, signed and sealed by a South Carolina registered land surveyor or civil engineer. The survey must include:

- Current tax map or pin number, subdivision name, lot, block and section
- Footprints and elevations of any structures, decks, secondary buildings, fences or other tangible items drawn to scale (1" = 20')
- Driveway cuts and dimensions
- Proposed water meter and sewer location
- Include drainage flow direction arrows, roof downspouts and associated piping, adjacent roads, ditches, pipelines, culverts, any existing and proposed watercourse, wetland, swales, pipes, catch basins, etc.
- Elevations of the center of the road, existing and proposed, of all corners at 25-foot intervals along and 5 feet beyond each property line, and at any distinguishing feature on or off site that could in any way impact storm water flow from the property.
- Flood zone lines, if applicable. If the property is in a flood hazard zone, the proposed elevation of the lowest finished floor or the bottom of the lowest horizontal support member, depending on the flood hazard zone.

Additional requirements for design and construction are as follows:

- **Walkover shall be designed in accordance with the 2015 International Building Code.**
- Walkway from house to dune must be of wood construction and no more than 6" above grade
- This safety design will apply to steps, guardrails, handrails and handicap ramps
- Dune walkovers may be constructed without an OCRM permit if they are constructed according to the following criteria:
  - All components must be constructed of wood
  - Have a maximum width of six (6) feet
  - Conform to the contour of the dunes with a two (2) foot vertical clearance between the surface of the dune and top of the walkway
  - Displace no sand in the critical area
  - Be constructed with as little environmental damage as possible
  - Not be located within fifty (50) feet of another walkway on the same parcel of property
  - Be shore perpendicular, except as necessary for handicapped access
  - No concrete footings are allowed
  - A minimum of two (2) risers to extend below existing grade
  - Handicap ramps shall slope from the deck to the toe of the dunes and then run parallel to the beach.

Rev 7/1/16

PLAINTIFF'S EXHIBIT 18 1-24-17-TD
PENGAD 800-631-6989

Culture and Leisure Work Orders

Work Order Number 1719

Location 77th Avenue North
77th Avenue North

Requested By Richard Kirby

Requester's Phone Number/Extension 2390

Scheduled For 08/20/2014

Service Provider Edsel

Classification Carpentry Priority Code Emergency

Describe Problem In Detail

Repair top rail that has fallen off of access.

Work Order Status Completed

Materials Cost 7.95

LPO#s 162245

Start Time

End Time

Total Time 1.50 hours

Details of Work Provided

Reattached top rails. Screws had rusted into to cause them to break when leaned on. One end was still attached. Used new screws to reattach boards to posts. Boards were in good condition. Put new screws all the way down board to the side rail. Tested rail to see if I could go throught it. Checked the whole walkway.

Completed By Edsel Date 08/20/2014

PENGAD 800-631-6989 PLAINTIFF'S EXHIBIT 19 1-24-17 HD

Bobby Funcik

O. SAND DUNE MANAGEMENT

(1) Walkways over dunes as provided in Section 48-39-130(D), shall meet the following requirements:

(a) Be constructed of wood;

(b) Have a maximum width of six feet;

(c) Conform with the contour of the dunes and provides a 2 (two) foot vertical clearance;

(d) Displace no sand in a critical area;

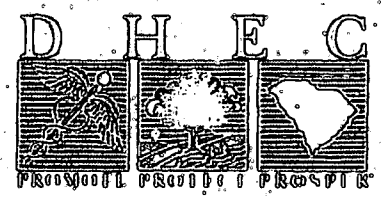
(e) Be constructed with as little environmental damage as possible;

(f) Not be located within fifty feet of another walkway on the same parcel of property;

(g) Be limited to no more than one of these structures per lot unless a limit of one would cause an unnecessary hardship as determined by the SCDHEC-Office of Ocean & Coastal Resource Management (OCRM).

(h) Be shore perpendicular, except as necessary for handicapped access.



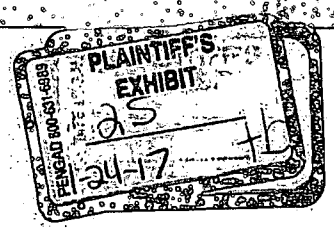


Ocean and Coastal
Resource Management

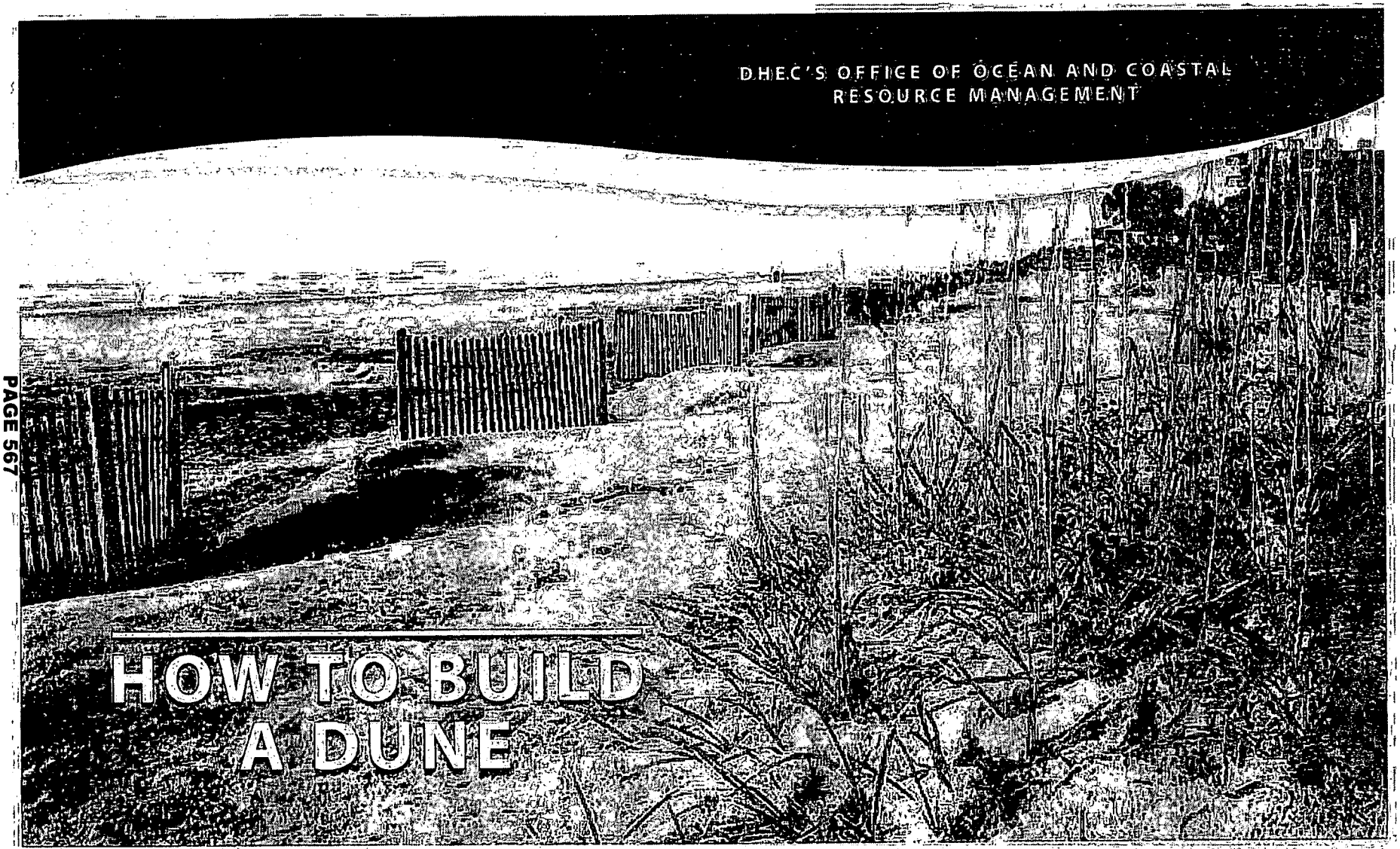
South Carolina Department of Health
and Environmental Control

Quantity:	500
Total printing cost:	$375
Cost per unit:	$.75

CR-004334 8/07



DHEC'S OFFICE OF OCEAN AND COASTAL RESOURCE MANAGEMENT



HOW TO BUILD A DUNE

Introduction

"How to Build a Dune" is a how-to manual for those who want to preserve South Carolina's beaches. This booklet contains instructions for projects that help nature increase the size and stamina of sand dunes.

For each project the basic principles are the same: help nature without completely replacing it; fit the dune into natural dune patterns; allow room for the dune to adjust to the natural dynamics of the area; and prevent damage by beach users whenever possible.

Each stretch of beach is unique, so care must be taken when deciding which dune building method is right for your situation. A project may work in one area only to be ineffective in another. Erosion rates, coupled with initial cost and projected maintenance requirements, are important to consider.

In some areas high erosion rates and narrow beaches make some building projects unfeasible.

Before beginning any beach enhancement/protection project you need to determine which federal, state or local permits are needed. Personnel from DHEC's Office of Ocean and Coastal Resource Management in Charleston, Myrtle Beach and Beaufort will be happy to answer many of your questions.

Sand Dune Dynamics

Shorelines are constantly moving and changing. A stretch of beach may be beautifully wide one season and yet show signs of erosion the next. An understanding of the sand exchange system explains this phenomenon.

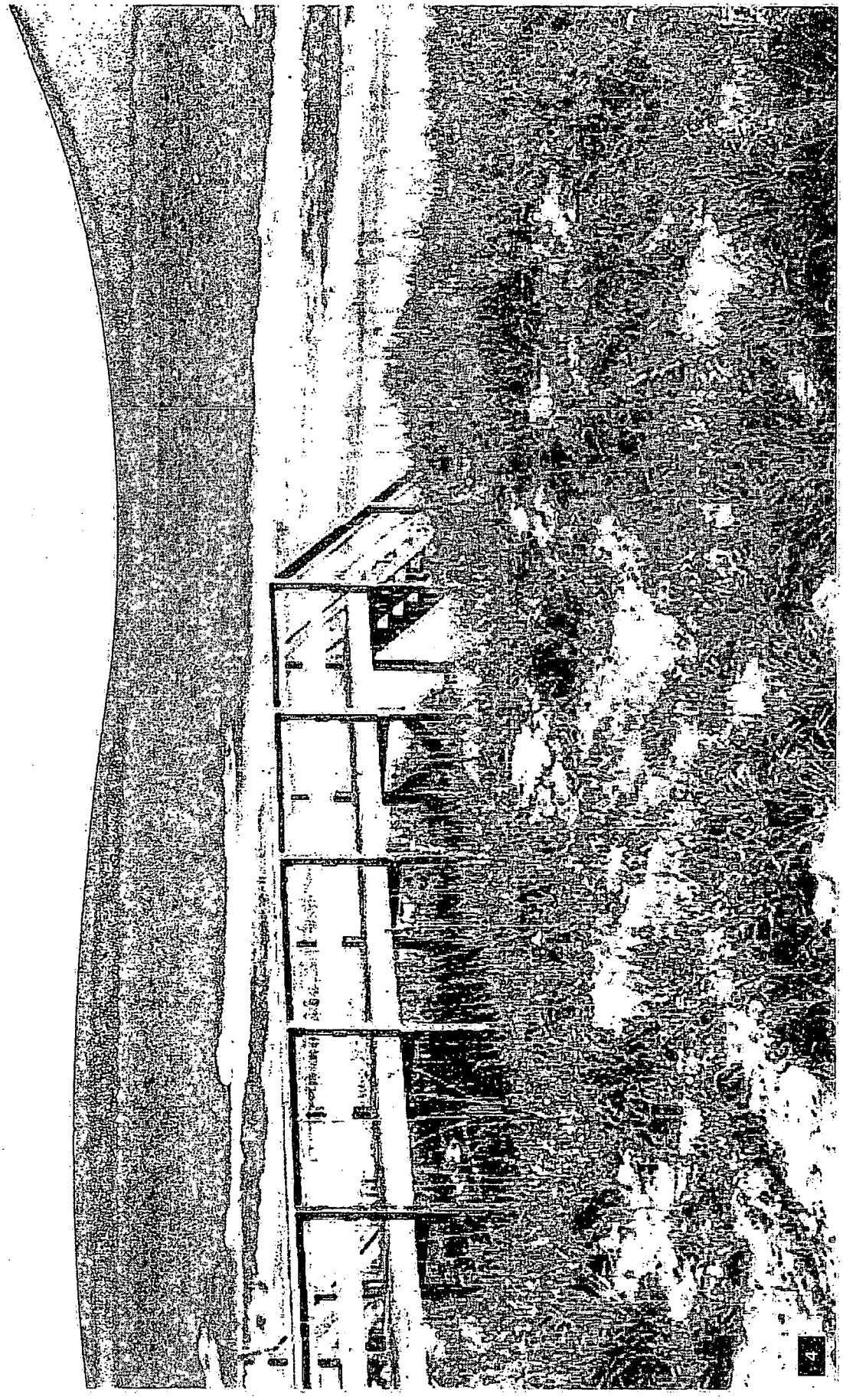
During the winter, strong winds and stormy weather cause large, powerful ocean waves to form. As these waves pound the beach, sand erodes and is deposited on offshore bars. The beach narrows.

Conditions change beginning in early spring. Milder waves and winds wash over the beach, bringing back the sand. Gradually the shore becomes wider.

In an ideal situation, this summer accretion and winter erosion counteracts each other. The beach remains about the same size, year after year. Very rarely, however, is a situation ideal. Quite frequently the erosional portion of the cycle prevails and the beach begins to wash away.

Sand dunes are very helpful during these erosional times. These dunes become sand savings account, providing extra sand that is to be withdrawn every time erosional waves demand it. When this sand reserve is not available, ocean waves often rush upland, taking high ground instead. Even low dunes (2 to 3 feet tall) can mean the difference between simple beach erosion and the destruction of private property.

By using the methods described in this manual, property owners can increase their sand savings account by helping nature build and stabilize protective sand dunes. Portions of these newly created dunes will erode in the same matter as a "natural" dune, but much of the sand should return the next season.



Planting a Dune

One of the most effective and aesthetically pleasing ways to build and stabilize a sand dune is to cover it with vegetation. The foliage helps increase the size of the dune by trapping wind blown sand. Plant roots also contribute as they bind sand particles to the dune.

Very few plants can live within the harsh beach environment. The vegetation must be able to withstand large blasts and accumulations of sand and salt spray. Nutrients are scarce. Droughts are severe and scorching heat waves are frequent.

Fortunately, three types of herbaceous grasses are suited to flourish on the beaches of South Carolina.

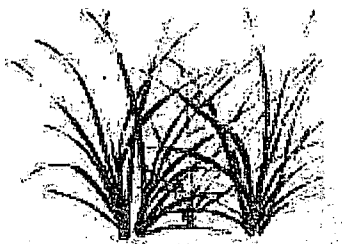
American Beachgrass

This strain is an excellent dune stabilizer that is easily transplanted. Beachgrass grows rapidly and can effectively trap sand by the middle of its first growing season. The Hatteras variety is especially hardy and is available commercially.

Beachgrass should be planted from November through April, with the earlier days preferred. The plants should be installed to a dept of 8 to 10 inches, with the center portion of a plot having 18 inch spacing between plants, widening to 3 to 4 feet apart at the base. This varied spacing allows blowing sand to better penetrate tall areas, thereby building a wider, flatter dune.

Sprigging should be done by hand, making sure each plant is secure in the sand. As a rough guide for planting, remember that 1,000 plants should cover a 50 by 100 foot strip.

American beachgrass is susceptible to both disease and insects, so intermingle this plant with panicum and sea oats.



Beachgrass



Sea Oats

A strong plant, sea oats are drought and heat tolerant and relatively free of pests. Sea oats resemble American beachgrass but die back in the winter. Plant this grass from March to June at a depth of 8 to 10 inches. Sprig according to the direction given for American beachgrass, taking care to plant the sea oats deep enough in the soil, since this grass thrives with moisture at its roots.

Sea oats are often difficult to find commercially, but mature oats can sometimes be transplanted. This plant is a slow grower, taking two full growing seasons before acting as a dune stabilizer. For this reason, sea oats should be interplanted with American beachgrass.



Bitter Panicum

Bitter panicum grass is excellent for high and dry sites. The plant is extremely hardy and a rapid grower. Bitter panicum should be planted from March through June at a depth of 6 inches, spaced 18 inches apart. This plant proliferates through rhizomes (runners) and will root at each node on the stem, just like centipede grass. Place the runners in a trench with about 6 to 8 inches protruding from the sand. When planting small plants, use the same methods recommended for American beachgrass.

Other Planting Tips

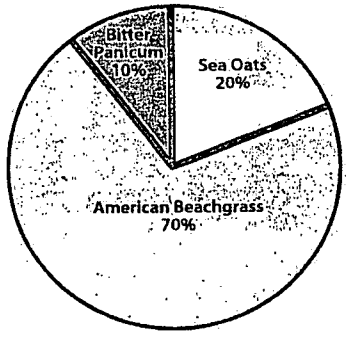
One of the best planting schemes is to combine all three grasses so that the inadequacies of one (slow growth, susceptibility to disease, etc.) can be counteracted by its neighbor. Make approximately 10 percent of your total planting bitter panicum, 20 percent sea oats, and the remainder American beachgrass. Plant these mainly on the area of the dune closest to the ocean.

Fertilization is vital to the success of dune plantings, particularly when the plants are starting. Beach sand is deficient in nitrogen, so a high nitrogen formulation (19-8-5 or similar mixture) is recommended. Ten pounds of this fertilizer per 1,000 square feet applied three times during the first growing season will encourage a healthy start. Thereafter, 5 pounds per 1,000 feet twice a season should be sufficient. Fertilizer should be broadcast by hand since ground spreading equipment can damage fragile seedlings.

Irrigating a dune is often not practical and is usually not necessary. When the plants do die, leave the remains on the dune. As the plants decay, a mulch is created that provides a vital element for future plant growth.

All plantings should take place as far from the surf as feasible. Dunes are an effective "sand savings account" for storms and abnormally high tides, but a dune won't last and vegetation won't grow in an area that is regularly inundated by the sea.

The use of sand fencing will increase the success rate of a dune vegetation project.



PLEASE
KEEP
OFF
DUNES

Sand Fencing

The function of sand fencing is to speed accumulation of sand in the location chosen for dune reconstruction. Proper fencing will slow the wind, thereby allowing wind-blown sand grains to drop and collect around the fence.

Commercial sand fencing is available in several forms: fabric, plastic and the common wood and wire "snow fence." Almost any kind of fence can be used provided the structure does not completely block the wind. Don't use either solid or open fencing (such as chicken wire). Fifty percent of solid material seems to work well. The best height for a fence is approximately 2 feet. Most commercial fencing comes 4 feet tall but can easily be cut in half.

Sand fencing should be put up far enough in advance of any planting of vegetation to allow the sand to build to 2-thirds the height of the fence. This height (12 to 18 inches) is deep enough to aid in plant stability, but shallow enough for the roots to reach the water tables.

Fencing should be placed within the outline of the planned dune and:

- Above the highest wave uprush
- Not within the range of the seasonal storm tides
- Aligned with any neighboring dunes
- Placed where it won't hinder public access
- Placed so as to not hinder loggerhead turtle nesting.

Where possible, fence ends should tie in with neighboring dunes. As fences are buried, new ones may be erected to increase the size of the dune even further.

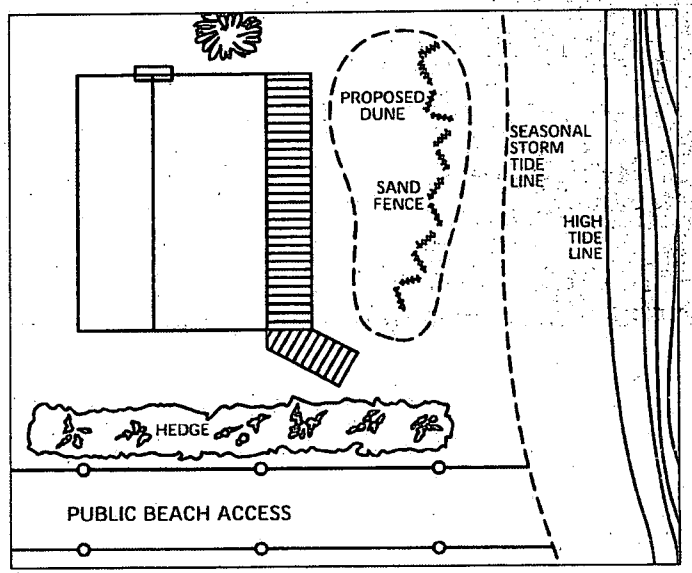
The recommended sand fencing configuration is a series of "V" sections in a line parallel to the ocean. Make sure the sand fence "V" shape points away from the ocean and that there are 5-foot breaks in the fencing to allow loggerhead turtles to move freely from the dune to the ocean.

10

Plan of Dune Placement

Wooden posts will anchor the fence. These should be placed about 10 feet apart (2 feet apart is a minimum) and driven into the sand deeply enough to secure it under a load of sand which may gather primarily on one side (12-18 inches).

Another benefit of a sand fence is that they seem to make people think twice before crossing a dune. Fences can be erected in such a way as to direct walking traffic to legitimate dune walkovers. An additional insurance policy is to install a sign that asks people to stay off the dunes. Signs are available for a nominal cost from DHEC-OCRM. A dune walkover (which is discussed in another section) may be necessary.

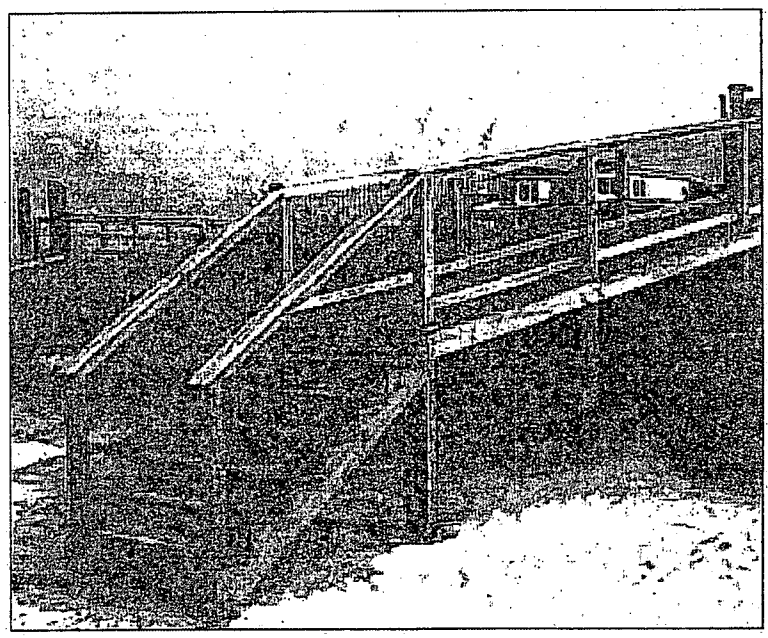


Dune Walkovers

Pedestrian traffic can do more harm to a dune than most people realize. A walkover, which is a bridge over the dune, saves a lot of unnecessary wear and tear. Dune walkovers may be constructed without a permit from OCRM if they are built according to the following criteria:

- Must be constructed of wood
- Can be no wider than 6 feet
- Must follow the existing dune contours
- Must not displace sand
- Must be constructed with as little environmental damage as possible.

Placing sand fencing around the walkover will encourage beach goers to use it.



DHEC/OCRM OFFICES

Visit our Web site at:

http://www.scdhec.gov/ocrm

Charleston (main)

1362 McMillan Avenue, Suite 400
Charleston, S.C. 29405

Phone: (843) 953-0200
Fax: (843) 953-0201

Beaufort

104 Parker Drive
Beaufort, S.C. 29906

Phone: (843) 846-9400
Fax: (843) 846-9810

Myrtle Beach

927 Shine Avenue
Myrtle Beach, S.C. 29577

Phone: (843) 237-4528
Fax: (843) 238-4526

PLAINTIFF'S EXHIBIT 26 1247-16 PENGAD 800-631-6989

the release mechanism shall be located on the pool side of the gate. Self-closing and self-latching gates shall be maintained such that the gate will positively close and latch when released from an open position of 6 inches (152 mm) from the gatepost. No existing pool enclosure shall be removed, replaced or changed in a manner that reduces its effectiveness as a safety barrier.

Exception: Spas or hot tubs with a safety cover that complies with ASTM F 1346 shall be exempt from the provisions of this section.

SECTION 304
EXTERIOR STRUCTURE

304.1 General. The exterior of a structure shall be maintained in good repair, structurally sound and sanitary so as not to pose a threat to the public health, safety or welfare.

304.1.1 Unsafe conditions. The following conditions shall be determined as unsafe and shall be repaired or replaced to comply with the *International Building Code* or the *International Existing Building Code* as required for existing buildings:

1. The nominal strength of any structural member is exceeded by nominal loads, the load effects or the required strength;
2. The *anchorage* of the floor or roof to walls or columns, and of walls and columns to foundations is not capable of resisting all nominal loads or load effects;
3. Structures or components thereof that have reached their limit state;
4. Siding and masonry joints including joints between the building envelope and the perimeter of windows, doors and skylights are not maintained, weather resistant or water tight;
5. Structural members that have evidence of *deterioration* or that are not capable of safely supporting all nominal loads and load effects;
6. Foundation systems that are not firmly supported by footings, are not plumb and free from open cracks and breaks, are not properly *anchored* or are not capable of supporting all nominal loads and resisting all load effects;
7. Exterior walls that are not *anchored* to supporting and supported elements or are not plumb and free of holes, cracks or breaks and loose or rotting materials, are not properly *anchored* or are not capable of supporting all nominal loads and resisting all load effects;
8. Roofing or roofing components that have defects that admit rain, roof surfaces with inadequate drainage, or any portion of the roof framing that is not in good repair with signs of *deterioration*, fatigue or without proper anchorage and incapable of supporting all nominal loads and resisting all load effects;
9. Flooring and flooring components with defects that affect serviceability or flooring components that show signs of *deterioration* or fatigue, are not properly *anchored* or are incapable of supporting all nominal loads and resisting all load effects;
10. Veneer, cornices, belt courses, corbels, trim, wall facings and similar decorative features not properly anchored or that are anchored with connections not capable of supporting all nominal loads and resisting all load effects;
11. Overhang extensions or projections including, but not limited to, trash chutes, canopies, marquees, signs, awnings, fire escapes, standpipes and exhaust ducts not properly *anchored* or that are *anchored* with connections not capable of supporting all nominal loads and resisting all load effects;
12. Exterior stairs, decks, porches, balconies and all similar appurtenances attached thereto, including *guards* and handrails, are not structurally sound, not properly *anchored* or that are *anchored* with connections not capable of supporting all nominal loads and resisting all load effects; or
13. Chimneys, cooling towers, smokestacks and similar appurtenances not structurally sound or not properly *anchored*, or that are anchored with connections not capable of supporting all nominal loads and resisting all load effects.

Exceptions:

1. When substantiated otherwise by an *approved* method.
2. Demolition of unsafe conditions shall be permitted when *approved* by the *code official*.

304.2 Protective treatment. All exterior surfaces, including but not limited to, doors, door and window frames, cornices, porches, trim, balconies, decks and fences, shall be maintained in good condition. Exterior wood surfaces, other than decay-resistant woods, shall be protected from the elements and decay by painting or other protective covering or treatment. Peeling, flaking and chipped paint shall be eliminated and surfaces repainted. All siding and masonry joints, as well as those between the building envelope and the perimeter of windows, doors and skylights, shall be maintained weather resistant and water tight. All metal surfaces subject to rust or corrosion shall be coated to inhibit such rust and corrosion, and all surfaces with rust or corrosion shall be stabilized and coated to inhibit future rust and corrosion. Oxidation stains shall be removed from exterior surfaces. Surfaces designed for stabilization by oxidation are exempt from this requirement.

[F] 304.3 Premises identification. Buildings shall have *approved* address numbers placed in a position to be plainly legible and visible from the street or road fronting the property. These numbers shall contrast with their background. Address numbers shall be Arabic numerals or alphabet letters. Numbers shall be a minimum of 4 inches (102 mm) in height with a minimum stroke width of 0.5 inch (12.7 mm).

304.4 Structural members. All structural members shall be maintained free from *deterioration*, and shall be capable of safely supporting the imposed dead and live loads.

304.5 Foundation walls. All foundation walls shall be maintained plumb and free from open cracks and breaks and shall be kept in such condition so as to prevent the entry of rodents and other pests.

304.6 Exterior walls. All exterior walls shall be free from holes, breaks, and loose or rotting materials; and maintained weatherproof and properly surface coated where required to prevent *deterioration*.

304.7 Roofs and drainage. The roof and flashing shall be sound, tight and not have defects that admit rain. Roof drainage shall be adequate to prevent dampness or *deterioration* in the walls or interior portion of the structure. Roof drains, gutters and downspouts shall be maintained in good repair and free from obstructions. Roof water shall not be discharged in a manner that creates a public nuisance.

304.8 Decorative features. All cornices, belt courses, corbels, terra cotta trim, wall facings and similar decorative features shall be maintained in good repair with proper anchorage and in a safe condition.

304.9 Overhang extensions. All overhang extensions including, but not limited to canopies, marquees, signs, metal awnings, fire escapes, standpipes and exhaust ducts shall be maintained in good repair and be properly *anchored* so as to be kept in a sound condition. When required, all exposed surfaces of metal or wood shall be protected from the elements and against decay or rust by periodic application of weather-coating materials, such as paint or similar surface treatment.

304.10 Stairways, decks, porches and balconies. Every exterior stairway, deck, porch and balcony, and all appurtenances attached thereto, shall be maintained structurally sound, in good repair, with proper anchorage and capable of supporting the imposed loads.

304.11 Chimneys and towers. All chimneys, cooling towers, smoke stacks, and similar appurtenances shall be maintained structurally safe and sound, and in good repair. All exposed surfaces of metal or wood shall be protected from the elements and against decay or rust by periodic application of weather-coating materials, such as paint or similar surface treatment.

304.12 Handrails and guards. Every handrail and guard shall be firmly fastened and capable of supporting normally imposed loads and shall be maintained in good condition.

304.13 Window, skylight and door frames. Every window, skylight, door and frame shall be kept in sound condition, good repair and weather tight.

304.13.1 Glazing. All glazing materials shall be maintained free from cracks and holes.

304.13.2 Openable windows. Every window, other than a fixed window, shall be easily openable and capable of being held in position by window hardware.

304.14 Insect screens. During the period from [DATE] to [DATE], every door, window and other outside opening required for *ventilation* of habitable rooms, food preparation areas, food service areas or any areas where products to be included or utilized in food for human consumption are processed, manufactured, packaged or stored shall be supplied with *approved* tightly fitting screens of minimum 16 mesh per inch (16 mesh per 25 mm), and every screen door used for insect control shall have a self-closing device in good working condition.

Exception: Screens shall not be required where other *approved* means, such as air curtains or insect repellent fans, are employed.

304.15 Doors. All exterior doors, door assemblies, operator systems if provided, and hardware shall be maintained in good condition. Locks at all entrances to dwelling units and sleeping units shall tightly secure the door. Locks on means of egress doors shall be in accordance with Section 702.3.

304.16 Basement hatchways. Every *basement* hatchway shall be maintained to prevent the entrance of rodents, rain and surface drainage water.

304.17 Guards for basement windows. Every *basement* window that is openable shall be supplied with rodent shields, storm windows or other *approved* protection against the entry of rodents.

304.18 Building security. Doors, windows or hatchways for *dwelling units*, room units or *housekeeping units* shall be provided with devices designed to provide security for the *occupants* and property within.

304.18.1 Doors. Doors providing access to a *dwelling unit*, *rooming unit* or *housekeeping unit* that is rented, leased or let shall be equipped with a deadbolt lock designed to be readily openable from the side from which egress is to be made without the need for keys, special knowledge or effort and shall have a minimum lock throw of 1 inch (25 mm). Such deadbolt locks shall be installed according to the manufacturer's specifications and maintained in good working order. For the purpose of this section, a sliding bolt shall not be considered an acceptable deadbolt lock.

304.18.2 Windows. Operable windows located in whole or in part within 6 feet (1828 mm) above ground level or a walking surface below that provide access to a *dwelling unit*, *rooming unit* or *housekeeping unit* that is rented, leased or let shall be equipped with a window sash locking device.

304.18.3 Basement hatchways. *Basement* hatchways that provide access to a *dwelling unit*, *rooming unit* or *housekeeping unit* that is rented, leased or let shall be equipped with devices that secure the units from unauthorized entry.

304.19 Gates. All exterior gates, gate assemblies, operator systems if provided, and hardware shall be maintained in good condition. Latches at all entrances shall tightly secure the gates.

SECTION 305
INTERIOR STRUCTURE

305.1 General. The interior of a structure and equipment therein shall be maintained in good repair, structurally sound

4. Masonry that has been subjected to any of the following conditions:
   4.1. *Deterioration;*
   4.2. *Ultimate deformation;*
   4.3. Fractures in masonry or mortar joints;
   4.4. Fissures in masonry or mortar joints;
   4.5. Spalling;
   4.6. Exposed reinforcement; or
   4.7. *Detached,* dislodged or failing connections.
5. Steel that has been subjected to any of the following conditions:
   5.1. *Deterioration;*
   5.2. Elastic deformation;
   5.3. *Ultimate deformation;*
   5.4. Metal fatigue; or
   5.5. *Detached,* dislodged or failing connections.
6. Wood that has been subjected to any of the following conditions:
   6.1. *Ultimate deformation;*
   6.2. *Deterioration;*
   6.3. Damage from insects, rodents and other vermin;
   6.4. Fire damage beyond charring;
   6.5. Significant splits and checks;
   6.6. Horizontal shear cracks;
   6.7. Vertical shear cracks;
   6.8. Inadequate support;
   6.9. *Detached,* dislodged or failing connections; or
   6.10. Excessive cutting and notching.

Exceptions:

1. When substantiated otherwise by an *approved* method.
2. Demolition of unsafe conditions shall be permitted when *approved* by the *code official.*

SECTION 307
HANDRAILS AND GUARDRAILS

307.1 General. Every exterior and interior flight of stairs having more than four risers shall have a handrail on one side of the stair, and every open portion of a stair, landing, balcony, porch, deck, ramp or other walking surface which is more than 30 inches (762 mm) above the floor or grade below shall have *guards.* Handrails shall not be less than 30 inches (762 mm) in height or more than 42 inches (1067 mm) in height measured vertically above the nosing of the tread or above the finished floor of the landing or walking surfaces. *Guards* shall not be less than 30 inches (762 mm) in height above the floor of the landing, balcony, porch, deck, or ramp or other walking surface.

Exception: *Guards* shall not be required where exempted by the adopted building code.

SECTION 308
RUBBISH AND GARBAGE

308.1 Accumulation of rubbish or garbage. All *exterior property* and *premises,* and the interior of every structure, shall be free from any accumulation of *rubbish* or garbage.

308.2 Disposal of rubbish. Every *occupant* of a structure shall dispose of all *rubbish* in a clean and sanitary manner by placing such *rubbish* in *approved* containers.

308.2.1 Rubbish storage facilities. The *owner* of every occupied *premises* shall supply *approved* covered containers for *rubbish,* and the *owner* of the *premises* shall be responsible for the removal of *rubbish.*

308.2.2 Refrigerators. Refrigerators and similar equipment not in operation shall not be discarded, abandoned or stored on *premises* without first removing the doors.

308.3 Disposal of garbage. Every *occupant* of a structure shall dispose of garbage in a clean and sanitary manner by placing such garbage in an *approved* garbage disposal facility or *approved* garbage containers.

308.3.1 Garbage facilities. The *owner* of every dwelling shall supply one of the following: an *approved* mechanical food waste grinder in each *dwelling unit;* an *approved* incinerator unit in the structure available to the *occupants* in each *dwelling unit;* or an *approved* leakproof, covered, outside garbage container.

308.3.2 Containers. The *operator* of every establishment producing garbage shall provide, and at all times cause to be utilized, *approved* leakproof containers provided with close-fitting covers for the storage of such materials until removed from the *premises* for disposal.

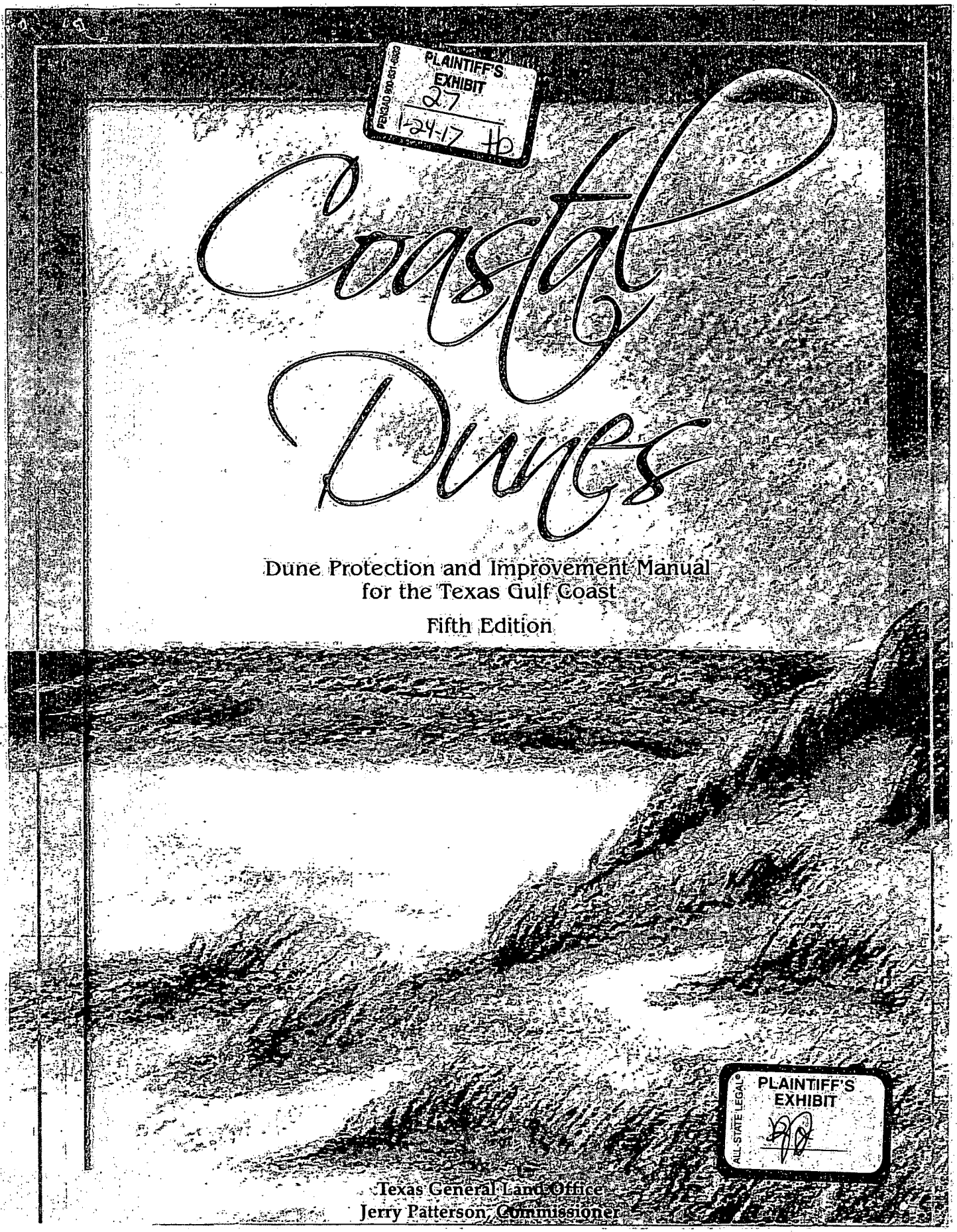
SECTION 309
PEST ELIMINATION

309.1 Infestation. All structures shall be kept free from insect and rodent *infestation.* All structures in which insects or rodents are found shall be promptly exterminated by *approved* processes that will not be injurious to human health. After pest elimination, proper precautions shall be taken to prevent reinfestation.

309.2 Owner. The *owner* of any structure shall be responsible for pest elimination within the structure prior to renting or leasing the structure.

309.3 Single occupant. The *occupant* of a one-family dwelling or of a single-*tenant* nonresidential structure shall be responsible for pest elimination on the *premises.*

309.4 Multiple occupancy. The *owner* of a structure containing two or more *dwelling units,* a multiple *occupancy,* a


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Coastal Dunes
Dune Protection and Improvement Manual
for the Texas Gulf Coast
Fifth Edition
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ALL STATE LEGAL
Texas General Land Office
Jerry Patterson, Commissioner

SUBCHAPTER A. GENERAL PROVISIONS

Sec. 63.001. Findings of Fact

The legislature finds and declares:

(1) that the mainland gulf shoreline, barrier islands, and peninsulas of this state contain a significant portion of the state's human, natural, and recreational resources;

(2) that these areas are and historically have been wholly or in part protected from the action of the water of the Gulf of Mexico and storms on the Gulf by a system of vegetated and unvegetated sand dunes that provide a protective barrier for adjacent land and inland water and land against the action of sand, wind, and water;

(3) that certain persons have from time to time modified or destroyed the effectiveness of the protective barriers and caused environmental damage in the process of developing the shoreline for various purposes;

(4) that the operation of recreational vehicles and other activities over these dunes have destroyed the natural vegetation on them;

(5) that these practices constitute serious threats to the safety of adjacent properties, to public highways, to the taxable basis of adjacent property, and constitute a real danger to natural resources and to the health, safety, and welfare of persons living, visiting, or sojourning in the area;

(6) that it is necessary to protect these dunes as provided in this chapter because stabilized vegetated dunes offer the best natural defense against storms and are areas of significant biological diversity;

(7) that vegetated stabilized dunes help preserve state-owned beaches and shores by protecting

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FOREWORD

By Commissioner Jerry Patterson

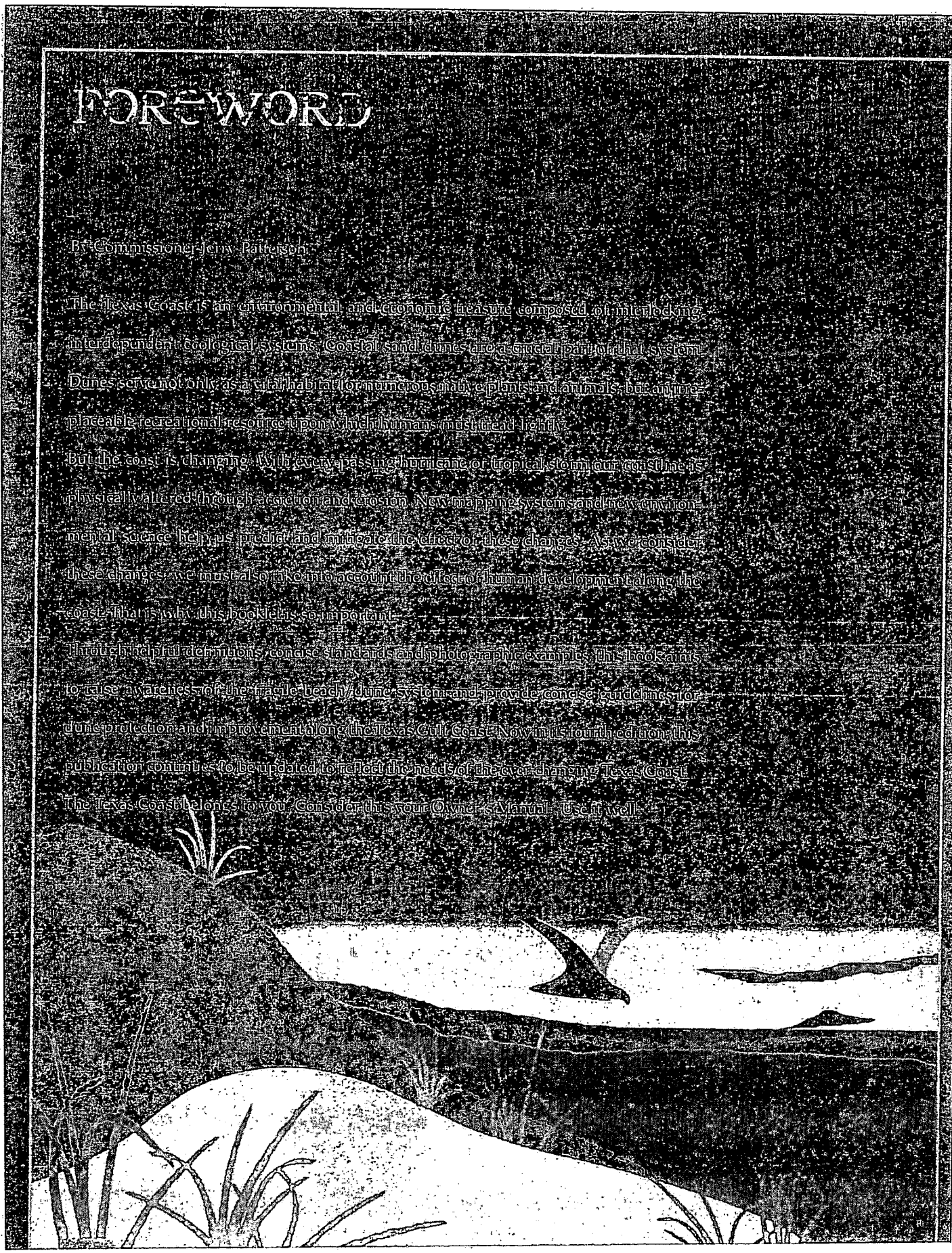
The Texas Coast is an environmental and economic treasure composed of interlocking, interdependent ecological systems. Coastal sand dunes are a crucial part of that system.

Dunes serve not only as a vital habitat for numerous native plants and animals, but an irreplaceable recreational resource upon which humans must tread lightly.

But the coast is changing. With every passing hurricane or tropical storm our coastline is physically altered through accretion and erosion. New mapping systems and new environmental science help us predict and mitigate the effect of these changes. As we consider these changes, we must also take into account the effect of human development along the coast. That is why this booklet is so important.

Through helpful definitions, concise standards and photographic examples, this book aims to raise awareness of the fragile beach/dune system and provide concise guidelines for dune protection and improvement along the Texas Gulf Coast. Now in its fourth edition, this publication continues to be updated to reflect the needs of the ever-changing Texas Coast.

The Texas Coast belongs to you. Consider this your Owner's Manual. Use it well.



INTRODUCTION

As a resilient natural barrier to the destructive forces of wind and waves, sand dunes are the least expensive and most efficient defense against storm-surge flooding and beach erosion. Dunes absorb the impact of storm surge and high waves, preventing or delaying intrusion of waters into inland areas. Dunes hold sand that replaces eroded beaches after storms and buffer windblown sand and salt spray. This natural defense can be strengthened by increasing the height and stability of existing dunes and by building new dunes.

Beach and dune protection is important along the Texas Gulf Coast, particularly in areas experiencing shoreline erosion and concentrated urban development.

The growth of mainland coastal population centers and the increasing development and recreational use of the barrier islands can impact the stability of the dune environment. Construction and heavy recreational use of the beaches can contribute to fragmentation of the beach/dune system and deterioration of dunes. The vegetation that secures sand is destroyed, sand is lost, and the dune line is breached by roads, trails, and storm runoff. Dune damage that results from human activities accelerates the damage caused by wind and wave erosion.

Inland areas become more vulnerable to hurricanes and tropical storms when the dune line is weakened. Protecting dunes helps prevent loss of life and property during storms and safeguards the sand supply that slows shoreline erosion. Protecting dunes also preserves and enhances the beauty of the coast and coastal ecosystems.

To succeed, dune improvement and protection efforts must be undertaken by federal, state, and local governmental entities. But even more valuable are efforts by those who live on the coast.

The Texas Coast will continue to attract Texans and other visitors in ever-greater numbers for years to come. This manual describes measures that landowners, city and county planners, developers, and industry can use to preserve sand dunes and promote dune restoration on the coast so that future generations can enjoy the natural beauty of the Texas Coast.

Beaches and Dunes

Terminology

The **beach** extends from the mean low tide line to the line of natural vegetation along the shoreline (fig. 1).

The **foreshore (wet beach)** is the area affected by normal daily tides.

The **backshore (dry beach)** is inundated only by storm tides and the higher spring tides. The backshore also supplies sand to the dunes.

Coppice mounds, the initial stages of dune growth, are formed as sand accumulates on the downwind side of plants and other obstructions on or immediately adjacent to the beach. The mounds are a source of sand that is exchanged via water with offshore bars. Coppice mounds may become vegetated and eventually increase in height, becoming foredunes.

Foredunes (also called fore-island dunes or primary frontal dunes) are the first clearly distinguishable, vegetated dune formations landward of the water. They are also the first to dissipate storm-generated wave and current energy. Although foredunes may be large and continuous, they typically are separate rounded knolls.

The **foredune ridge** is high, continuous, and well stabilized by vegetation. This ridge normally rises sharply landward from the foredune area but may rise directly from a flat, wave-cut beach immediately after a hurricane. The foredune ridge helps block storm surge and prevents it from washing inland.

Critical dunes are all dunes (coppice mounds, foredunes, foredune ridge, and some backdunes) that store sand to replenish eroding public beaches.

A **dune protection line** is established by a local government to preserve critical dunes and may be set no farther than 1,000 feet landward of mean high tide of the Gulf of Mexico. Special criteria apply to construction activities seaward of this line.

The **beach/dune system** includes all of the land from the line of mean low tide to the landward limit of dune formation.

A **public beach** is any beach, whether publicly or privately owned, extending inland from the line of mean low tide to the natural line of vegetation bordering on the Gulf of Mexico to which the public has acquired the right of use. This definition does not include a beach that is not accessible by a public road or public ferry.

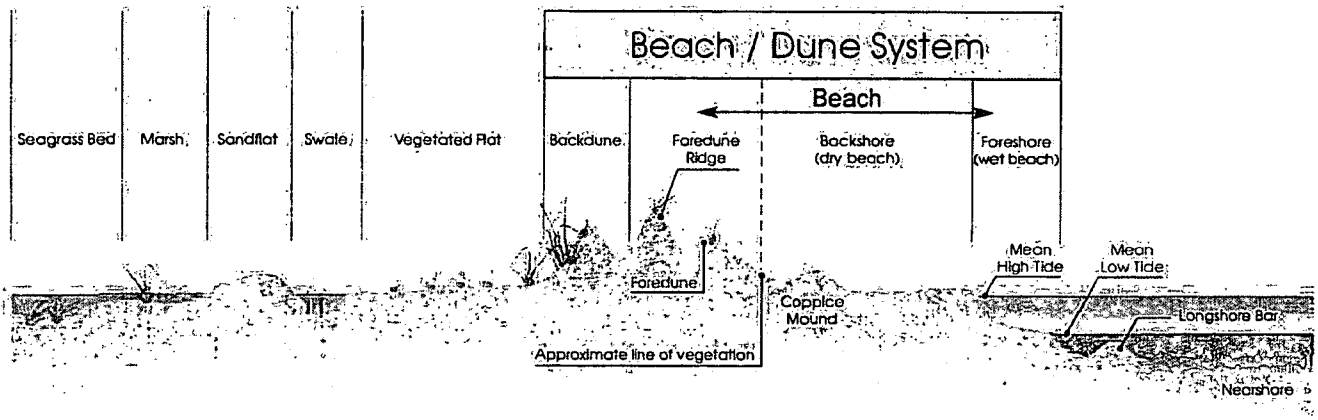


Figure 1: Typical cross section of a Texas barrier island. Actual conditions may vary.

The Sand Cycle

Beaches and dunes are integral parts of a dynamic environment in which sand is constantly exchanged.

During the calm conditions that prevail throughout most of the year on the Texas coast, waves average two to four feet in height and are less frequent than during storms. These calmer waves transport sand from offshore bars and the surf zone to the beach, causing the beach to gradually build up, or accrete. In time, sand is blown onto the foredune, where it is trapped by vegetation and stored until displaced by storms.

During a storm, high-energy waves flatten the beach. Waves washing against the base of the foredunes erode sand, undermining and collapsing the seaward dune face. In severe storms, the dune face commonly recedes several yards,—in extreme cases as much as 100 yards—leaving a steep cliff **(fig. 2)**. Sometimes dunes are completely destroyed. Retreating waves carry the eroded sand offshore and deposit it just seaward of the surf zone in large bars. This process of dune erosion and sand movement dissipates much of the energy of storm waves. Sandbars also dissipate storm wave energy by causing waves to break further offshore.

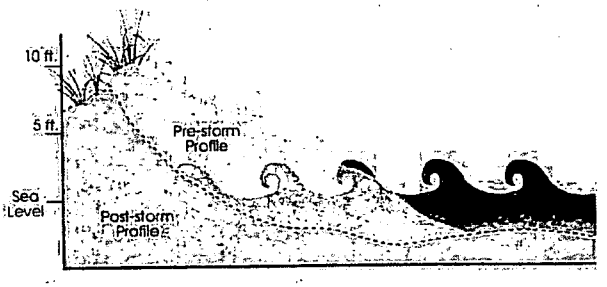


Figure 2. Result of storm waves on beaches and foredunes.

If the supply of sand remains constant, the natural exchange between the beach, dunes, and offshore areas will repair and rebuild dunes to a height and width determined by local conditions. However, the loss of vegetation that traps and holds sand makes the beach and dunes more susceptible to wind and water erosion, thus inhibiting their recovery from storms. Bays, channels, marshes, and grass flats behind the weakened foredune are exposed to storm-surge flooding and to accumulation of windblown sand.

Dune Damage

When the height of approaching storm waves exceeds the height of depressions along the dune ridge, water overflows the low points and washes down the landward side of the dunes, eroding sand and carrying it inland **(figs. 3 and 4)**. These washover (or overwash) areas deepen and widen under continual wave attack, allowing larger volumes of water to spill across the dune line and flow farther inland. Eroded sand may be deposited behind the dunes or carried into the bay, channel, marsh, or grass flat. In very severe storms, washover waters may even cut into interior land areas.

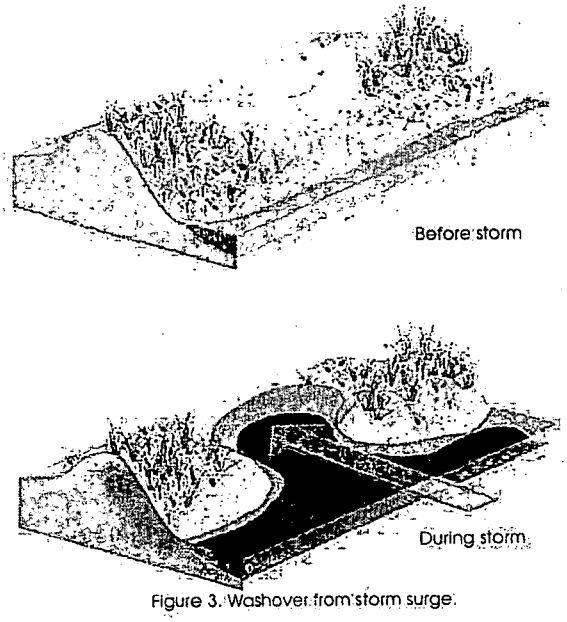


Figure 3. Washover from storm surge.

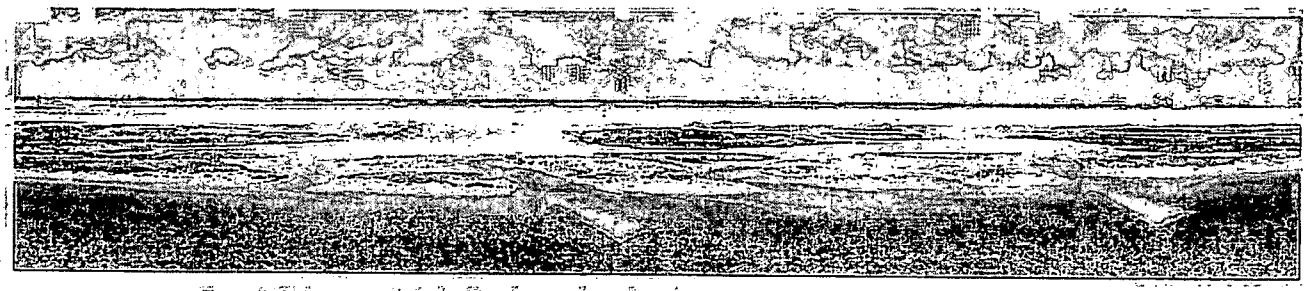


Figure 4. Oblique aerial photo of washover channels on Padre Island following Hurricane Brett in August 1999. Photo courtesy of David M. Stephens.

Areas of frequent major washovers may regenerate dunes slowly because of the volume of sand removed through erosion and because vegetation has been scoured away. Dune development may be impeded if the sand in a washover is too wet to be blown by the wind. Evidence of hurricane washovers is apparent on many Texas barrier islands.

Storms may also produce washouts in dune areas. These are similar to washovers, differing primarily in the direction of eroding waters. Generally, storm runoff from barrier islands and peninsulas is directed toward the bays. If there are breaches or depressions in the dunes, however, rainwater that collects in the swales (valleys between the dunes) may be channeled through these low points and overflow onto the beach, carrying sand with it.

Washouts may also be formed by retreating bay waters. Hurricanes, particularly slow-moving ones, may pile water into bay systems. If natural channels to the Gulf are too narrow to accommodate water retreating from the bays, washouts may cut across the low areas of least resistance in the barrier islands.

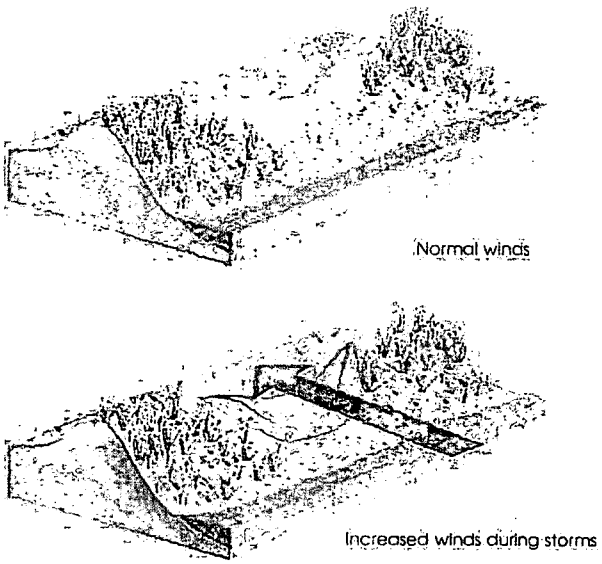


Figure 5. Formation of a blowout by wind in areas of a dune with little vegetative cover.

Blowouts are breaches in the dunes caused by wind erosion. They are aligned with prevailing southeasterly winds and are often cut down to the water table **(fig. 5)**. During storms, blowouts may become channels for storm-surge waters from the Gulf.

Eventually, following a storm, the natural beach/dune system can recover its pre-storm shape if enough sediment is available in the littoral system. In Texas, this process can take up to five years, first by beach accretion, then by dune formation, expansion, and vegetation colonization. Sometimes this process is interrupted by structures, such as buildings, that prevent winds from blowing sand that is necessary for dunes to form.

Human activities also take a toll on dunes. Construction, recreation, and grazing animals may accelerate or aggravate natural damage to the dunes by destroying vegetative cover and promoting development of breaches.

Seawalls, bulkheads, and groins may protect property landward of them against erosion. However, if waves persist, these structures can enhance shoreline erosion of adjacent properties and of the beach seaward of the structures. By withholding sand that would

otherwise be transported alongshore, erosion-control structures such as groins inhibit dune development in areas downdrift of them. In general, rigid structures are less efficient than the naturally resilient dunes as defense for the beach against storm surge. The beach directly in front of a vertical seawall may be eroded by waves rebounding off the structure during storms. The seawall itself may eventually be undermined.

Disturbance of the foredunes by vehicles, pedestrians, construction work, or grazing animals can promote wind erosion. If unchecked, this erosion can lead to almost complete removal of dunes, depleting the supply of sand available for exchange during storms. Sometimes entire dunes are bulldozed to level a construction site or to lay pipelines. In these cases, damage is not limited to the immediate site. Dunes adjacent to the site are exposed to wind erosion.

Devegetation of dunes can ultimately be as damaging as direct removal or withholding of sand. Vegetation is often removed from a large area when a construction site is cleared. Plants are trampled and uprooted by pedestrian traffic, motor vehicles, horses, and grazing cattle **(fig. 6)**. As trails are established along frequently used routes through the dunes, the vegetation is destroyed and the wind begins to carry sand from the exposed area.

The continual loss of sand deepens the trail. Sloughing away of sand from the trail's sides widens it. As a greater area is exposed to wind erosion, a blowout, washout, or washover may develop.

Beach access roads through the dunes are subject to the same erosive processes and may become channels for storm surge.



Figure 6. Human influences on dune stability; access through critical dune areas on Mustang Island.

Texas Coastal Dunes

The Texas coastline is composed of barrier islands, ancient deltaic headlands and peninsulas, bays and estuaries, and natural and man-made passes (fig. 7). These are mobile environments, constantly reshaped by the processes of erosion and accretion.

Dune development varies with sediment supply to the beach. The supply is determined by the quantity of inner-shelf sand carried onshore by waves and wind, the amount and kind of sediment discharged by rivers, and the degree of human interference with natural sand transport (for example, the interruption of longshore currents by jetties and groins). Rainfall patterns also affect dune development.

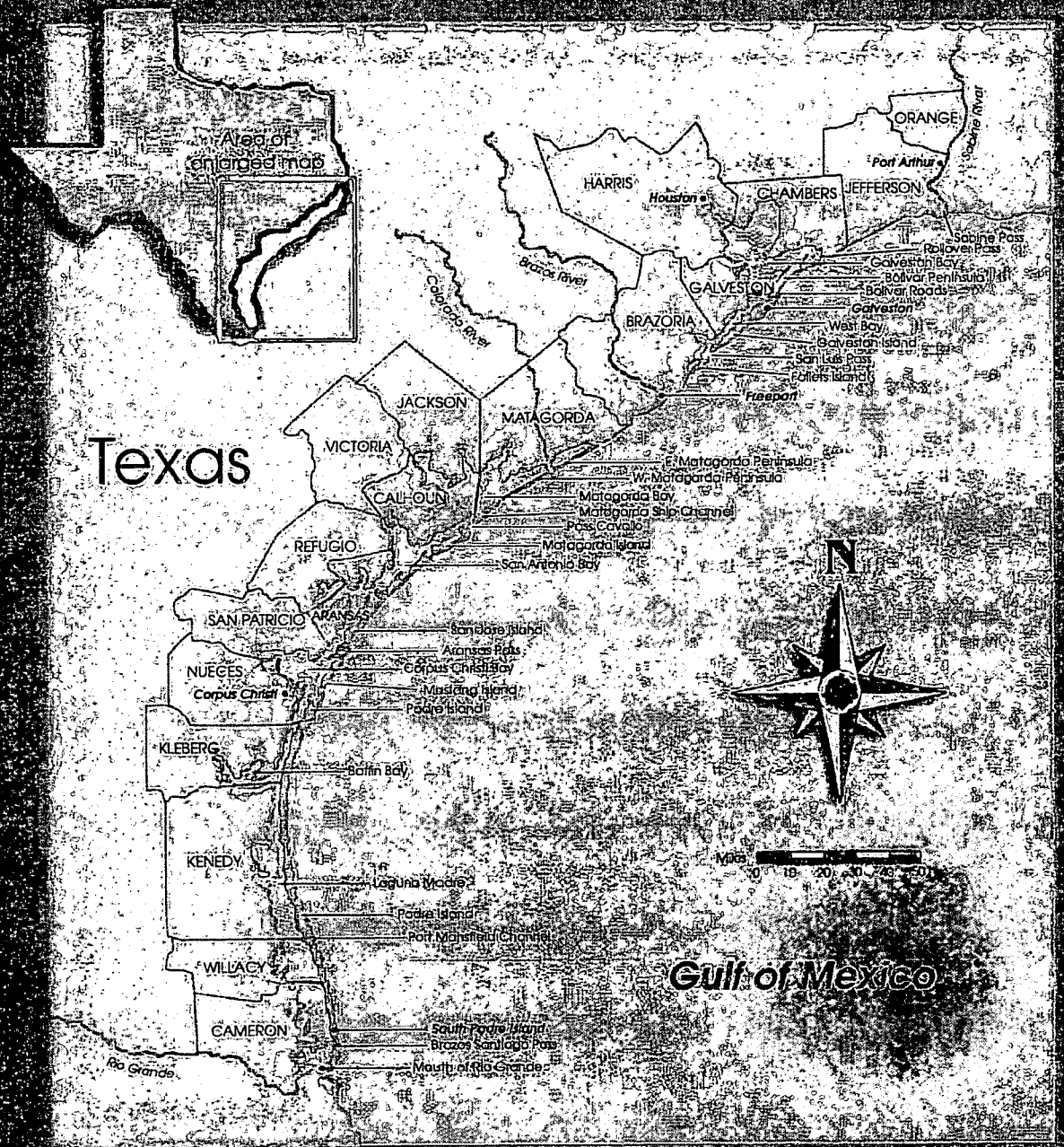


Figure 7. The Texas Coast

On the upper coast, in Jefferson and Chambers counties, beach and dune development is limited. The Sabine River carries silt rather than sand to the coast. The shoreline is characterized by low-lying marshes and tidal flats with intermittent thin, linear sand ridges (chenier plain). Dunes are also scarce along the Brazos-Colorado river headland—the southern portion of the Brazoria County shoreline. Here, too, little dune-building sand is available to the longshore current.

Few naturally occurring dunes can be found on Galveston Island and portions of Follets Island because many of the foredunes were wiped out during Hurricane Alicia in 1983 and subsequent storms like Tropical Storm Francis in 1999 and Hurricane Claudette in 2003. Shoreline development and high erosion rates have inhibited dune recovery **(fig. 8)**.

Vegetated and relatively stable dunes occur on Mustang Island and North Padre Island. On Matagorda and San Jose islands, where there is limited shorefront development, there is a continuous, well-defined foredune ridge averaging 15 to 20 feet above sea level. The most highly developed dune formations are found in Nueces and northern Kleberg counties, where there is a foredune ridge consisting of several rows of dunes that average 20 to 25 feet in height. Some dunes reach an elevation of 40 feet. Sandflats and areas of low coppice mounds are also characteristic of this region **(fig 9)**.

As rainfall decreases southward along the Texas Coast, dunes have less of the vegetative cover necessary for stabilization. Migrating dunes—bare of vegetation and highly susceptible to wind erosion—are common in the arid environment of the lower coast **(fig. 10)**. Dunes of this type occur on Padre Island. In Kenedy, Willacy, and Cameron counties, the foredune ridge is poorly developed and breached by numerous washovers and blowouts.

DUNE CONSTRUCTION, IMPROVEMENT, AND REPAIR

Several methods may be used to increase the height and stability of existing dunes, repair damaged dunes, encourage sand accumulation closer to the beach, or establish dunes where a low sand supply has inhibited dune formation or where dunes have been destroyed.

Where fresh sand deposits around obstructions such as grass clumps show conditions conducive to natural dune formation, plantings of native vegetation or structural barriers can be used to start and accelerate sand accumulation. Plantings of native vegetation should be the primary method for dune construction, improvement, and repair. Plant vegetation on grade in the backshore and close to the line of vegetation. Structures such as slatted wood or plastic sand fencing can help trap sand and stabilize dunes, but they should be used as a last resort and removed when vegetation is established.

In areas where the local sand supply is insufficient for these two sand-trapping methods to be effective, dunes can be artificially constructed with imported sand. All dune improvement project sites must be vegetated to maintain stability.

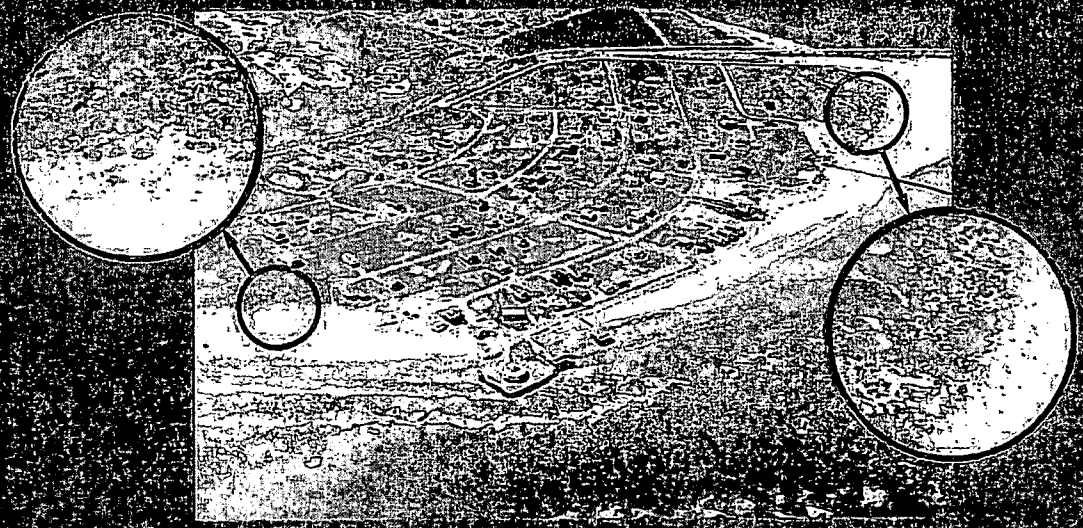


Figure 8. Gallatin Petrified Forest Natural Area formations (geological and scientific interest development controlled). Natural dunes exist where there is more sediment than wave action shaping the shoreline (wave action is more).



Figure 9. Natural dune formations on Pea Island in Dare County.



Figure 10. Nesting dune on Pea Island National Seashore.

Before any of the following procedures for dune construction or shoreline stabilization are employed, check with the local building official or the Texas General Land Office to avoid violation of state laws (see "Beach Access and Dune Protection Laws"). Agents from the U.S. Department of Agriculture Natural Resources Conservation Service can provide technical assistance for dune restoration projects (see "Where to Get Help").

"Beach Access and Dune Protection Laws" Refer to page 23.

"Where to Get Help" Refer to page 25.

Use of Vegetation

Three species of grass are appropriate for dune vegetation projects on the Texas coast: bitter panicum (*Panicum amarum*), sea oats (*Uniola paniculata*), and marshhay cordgrass (*Spartina patens*). Dune plants are not always available commercially in Texas. They usually are transplanted from natural stands.

Transplants from the vicinity of the project are more likely to survive than imported ones. If suitable stands cannot be found on the property where the vegetation project will be undertaken, it may be possible to obtain plants from neighboring property by agreement with property owners. A permit from the county commissioners court or from a city may be required if the harvesting or planting site is seaward of a dune protection line (see "Beach Access and Dune Protection Laws").

"Beach Access and Dune Protection Laws" Refer to page 23.

The best time of year to transplant vegetation south of Corpus Christi is January or February. The optimum time for transplanting north of Corpus Christi is February, March, or April.

Take plants only from dense stands in areas that are not subject to erosion. Plants should not be taken from coppice mounds or from foredunes that are sparsely vegetated. Be careful not to trample plants. Remove individual plants in a scattered pattern at intervals of no less than two feet. Dig them out with a "sharpshooter" shovel. Pulling plants damages the small hair roots needed for re-establishment. Obtain a good root structure to ensure plant survival.



Figure 11. Recently planted dune vegetation.

Small areas and steep slopes at the project site are best vegetated by hand. Set single plants into individual holes made with a shovel or dibble and pack each planting firmly. Large, flat areas can be more economically planted with tractor-drawn transplanters such as one- or two-row tobacco transplanters with their shoes extended to make holes eight to 10 inches deep. One thousand plants should stabilize a 50- by 100-foot strip within a year (fig. 11).

Immediate watering of transplants is not imperative, but success is increased if transplanting is done after a rain or if the dune is watered before transplanting. Apply mulch either before or after planting to minimize wind erosion, moderate soil temperature, and help retain moisture. Hay, burlap, and commercial screen or mesh made of natural

fiber may be used for this purpose. Hay is the most economical mulch. Use at least 3,000 pounds of hay per acre. Pack the hay into the soil to prevent it from blowing away. In areas where high winds are common, burlap or screen anchored with stakes is recommended instead of hay. All of these materials are biodegradable and will eventually break down over time.

Transplanted vegetation needs little maintenance. While watering new plants is helpful, continued watering is necessary only in drought conditions.

Fertilization may be used during the first year after transplanting but is usually unnecessary thereafter. An approved soils testing laboratory can provide fertilizer recommendations for a particular location. In general, three or four applications of 12-6-6 fertilizer, 90 to 100 pounds per acre, are recommended beginning in April or May. Mowing dune grasses destroys their ability to trap sand and may kill the plants. Planted areas should be protected from vehicles, pedestrians, and grazing animals with temporary fencing. Signs can be placed at the site to explain the purpose and importance of the project (fig. 12).

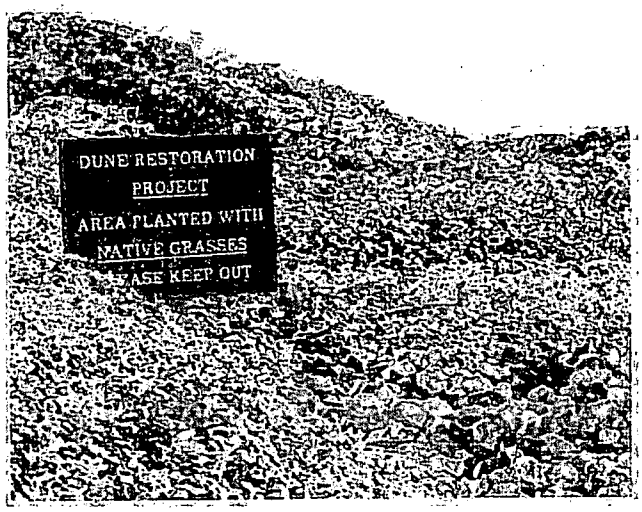


Figure 12. Sign for dune restoration project.

A transplant survival rate of 50 to 80 percent can be expected. If the survival rate is less than 10 percent, the area should be replanted. The vegetation should be fairly dense within one or two years. Any bare areas that remain after that time can be replanted with vegetation from the well-established sites.

Bitter Panicum

Bitter panicum has proved to be the best species for dune stabilization on the Texas coast. This native beach plant has a higher salt tolerance than many other coastal species and is a hardy grower. Its leaves are smooth, bluish-green, 1/4 to 1/2 inch wide, and four to 12 inches long (fig. 13). New plants are generated from tillers, shoots that grow from nodes on the roots. The seeds of bitter panicum are sterile and will not propagate new plants.


Figure 13. Bitter panicum (*Panicum amarum*).

Bitter panicum plants taken for vegetation projects should be two to three feet tall. Cut off the tops of harvested plants about one foot from the roots to reduce water loss (fig. 14). The plants can be stored for up to four weeks if the roots are wrapped in wet cloth or paper towels or immersed in fresh water.

The best period for planting bitter panicum is early winter to early summer, but survival is dependent mainly on

adequate moisture. The plants can be placed in the ground either upright or horizontally. In areas of rapidly shifting sand, upright planting will prevent the plants from being buried. Generally, the plants should be planted six inches deep on two-foot centers, but closer placement is recommended on the tops of dunes and on steep slopes. The transplant site must be protected from grazing animals, as bitter panicum is palatable to them.

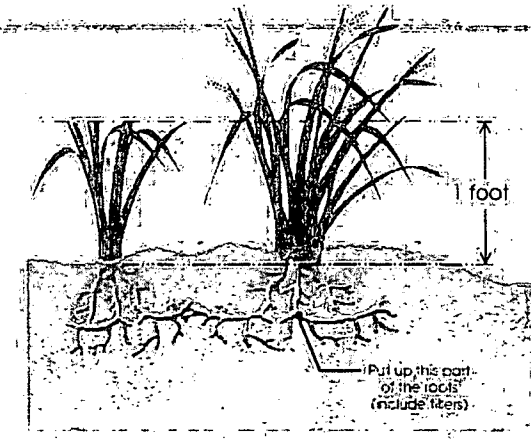


Figure 14. Harvesting and cutting bitter panicum.

Sea Oats

Sea oats, also native to the Texas coast, may be interspersed among plantings of bitter panicum. This grass has pale green, hardy leaves that die back each winter and stiff, seed-topped stems that grow to three feet or more in length (fig. 15). Sea oats are less tolerant of salt spray than bitter panicum but grow rapidly enough to avoid being smothered in rapidly shifting sand. Interplanting sea oats and bitter panicum will reduce the risk of disease or pest infestation.



Figure 15. Sea oats (*Uniola paniculata*).

Harvest only healthy, vigorous plants for transplanting. The younger sea oats have a greater success rate than the older, longer-rooted plants. Do not take a plant that has a seed head. Transplant the plants as soon as possible after they have been harvested. The plants will generally remain alive for up to four days if the roots are wrapped in wet cloth or paper towels or immersed in fresh water. As with bitter panicum, the tops of the plants should be cut to within one foot of the roots to reduce water loss.

The best time for planting sea oats is from October through April. Place plants at least eight to 10 inches deep on 18-inch centers in the main area of the dune, with graduated plantings extending to four feet apart at the edges.

It is best to mix a sea oat planting with bitter panicum at a ratio of one to one. Sea oats usually take two growing seasons to fully stabilize a dune, while bitter panicum, which grows more rapidly, can become established in one year.

Marshhay Cordgrass

Marshhay cordgrass is a small, wiry perennial which spreads by rhizomes (fig. 16). This grass does well on the landward side of dunes. If planted on the beach side, the grass is easily buried and destroyed by shifting sands. The most appropriate use for marshhay cordgrass is to repair the more stable portions of existing and new dunes.

June through November is the best time to plant marshhay cordgrass. Place the plants six

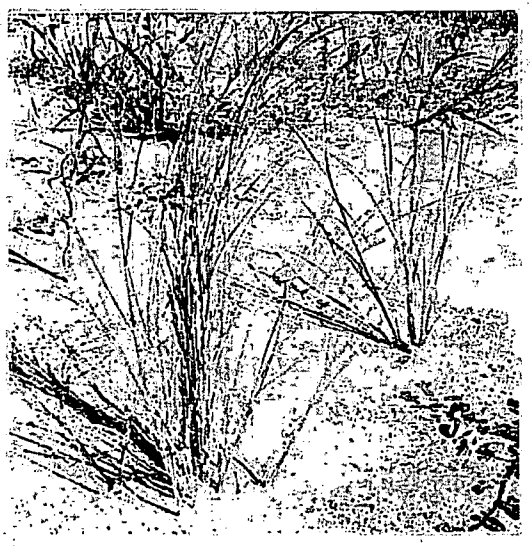


Figure 16. Marshhay cordgrass (*Spartina patens*). Photo courtesy of Frederique Perret.

to 10 inches deep and 12 to 36 inches apart to keep the base of each plant moist. Mixing marshhay cordgrass with plantings of bitter panicum produces best results.

Other Plants

Sea oats and bitter panicum, which commonly grow on the seaward face of foredunes, are highly erosion-resistant and easily established. However, other species of herbaceous plants also capture windblown sand and stabilize dunes.

Beach morning glory and seagrape vines can form a dense cover on the seaward side of dunes within a few growing seasons. Low-growing plants and shrubs found on the back side of the dunes include seacoast bluestem, cucumber leaf sunflower, rose ring gallardia, partridge pea, prickly pear, and lantana. Many of these are flowering plants, an attractive alternative to dune grasses though less effective as dune stabilizers.

Some of these species are available commercially in Texas. Contact the Texas General Land Office, the Kika de la Garza Texas Plant Materials Center, or the Lady Bird Johnson National Wildflower Center for a list of nurseries or if you have questions regarding the use of a specific plant species for a dune restoration project (see "Where to Get Help").

"Where to Get Help" Refer to page 25

Use of Sand Fences

The planting of native vegetation to trap sand is always preferable to the use of man-made structures. For reasons of aesthetics, safety, and possible interruption of public access, dune-building structures other than trees or brush must be removed as soon as they have served their purpose.

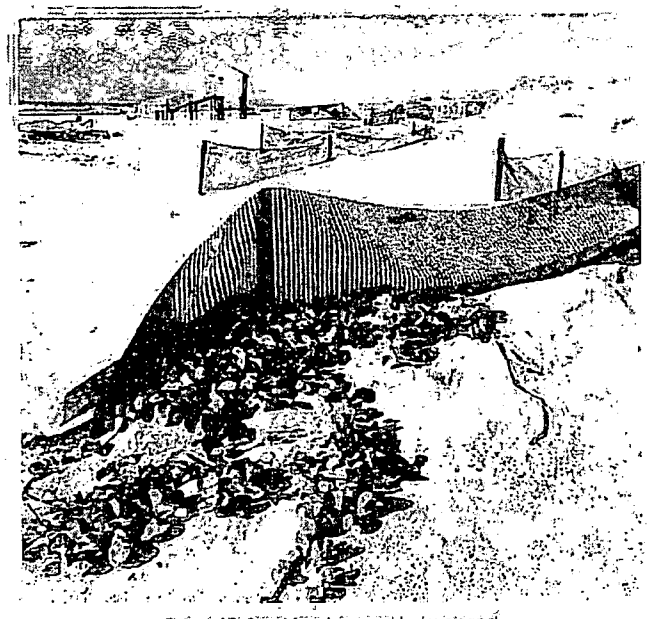


Figure 17. Sand fencing used to trap sand.

Standard slatted wood sand fencing is ideal for dune-building structures because it is inexpensive, readily available, easy to handle, and can be erected quickly.

Plastic fencing has the advantage of being strong, nondegradable, and reusable. Because plastic is non-flammable, it will not be taken for campfire fuel. Plastic fencing, however, is about three times as expensive as wooden sand fencing **(fig. 17)**. Successful experiments in stabilizing dunes and dune vegetation using porous jute netting as sand fencing and as protective ground cover have been conducted at the Padre Island National Seashore.

Trees (particularly discarded Christmas trees), brush, and seaweed can be also effective for trapping sand. Make sure that the piles are not too dense and that air can flow within

them. Inorganic debris such as automobile bodies, concrete, wire, or tires must not be used for dune building. These materials are not biodegradable and are safety hazards.

A height of four feet, measured from the ground surface after installation, is recommended for dune-building structures. In areas where sand conditions are poor for dune building, a height of two feet is appropriate.

The fencing can be supported with wooden posts or metal poles at 10-foot intervals. Wooden posts should be black locust, red cedar, white cedar, or other wood of equal life and strength. Treated pine may be used as well.

The minimum practical length for posts is 6.5 feet; a length of 7 to 8 feet is optimum. Wooden posts should be no larger than three inches in diameter **(fig. 18)**.

Secure the fencing material by fastening it to each post with four ties of galvanized wire (no smaller than 12 gauge), and weave the material between the posts so that every other post has fencing on the seaward side.

Trees, brush, and seaweed can be held in place with smooth wire strung between support posts. Another method is to anchor the vegetation to stakes driven into the ground.

If the base of a sand fence is placed at ground level, dunes will build over the structure. If the base is elevated four to six inches above the ground, dunes will build on the downwind side of the structure, and the fencing can be retrieved for reuse as the dunes are formed. In this case, place the structures five to 10 feet gulfward of the damaged area.

Sand fencing should be placed in non-continuous, diagonal segments—at least 35 degrees to the shoreline—so as not to adversely affect nesting sea turtles.

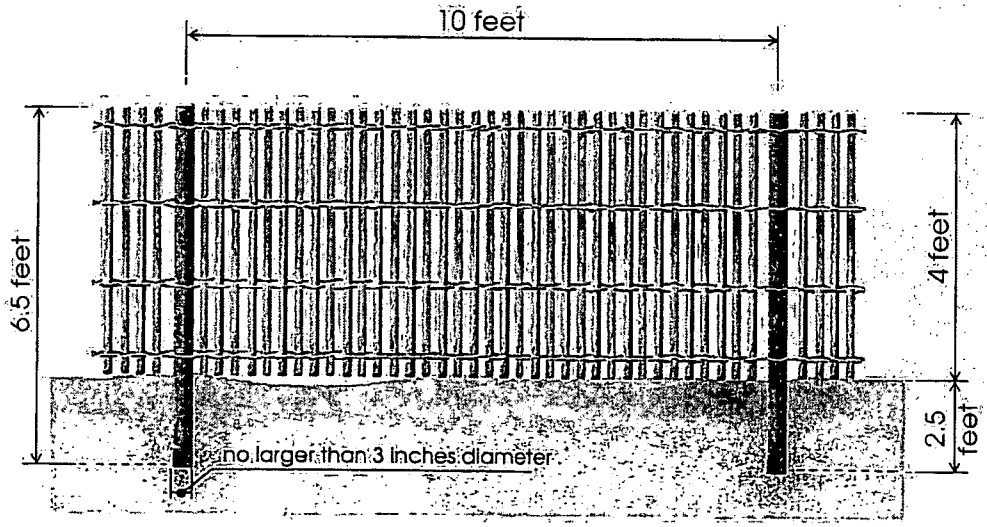


Figure 18. Sand fencing specifications for dune construction.

Breaches or Blowouts

In a breach or blowout, multiple tiers of dune-building structures can be used to increase sand entrapment and raise the ground elevation. Place the first structure at the landward end of the dune-building site. When sand has built up along this structure, erect a second structure about 20 feet seaward of it (fig. 19). After sand accumulates here, place a third structure between the first two. Offset the breaks in the tiers to facilitate sand entrapment.

The dune-building structure should not extend gulfward of the dune line on either side of a breach or blowout. The area should be vegetated for natural stabilization.

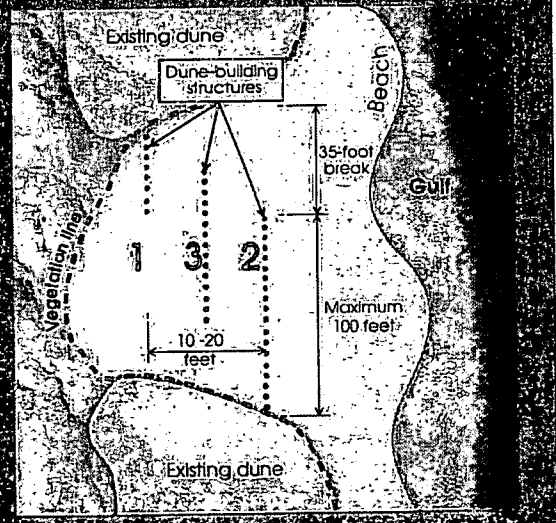


Figure 19. Placement of dune-building structures in breaches or blowouts.

Repairing Foredunes

To rebuild foredunes, place sand fencing or other appropriate structures perpendicular to the prevailing onshore wind. Leave a 35-foot gap between structures that are 100 feet long or more to prevent entrapment of storm surge water or rainwater in the trough between existing dunes and new dunes (fig. 20).

Place the first tier of dune-building structures no more than 20 feet gulfward of the base of the existing dune (the point at which the gulfward slope of the dune increases sharply). Later, place a second tier of structures on the back slope of the dune created by the first tier. This will increase dune height and fill any trough between the existing dune and the newly formed dune. Repeat this process to build the dune line gulfward.

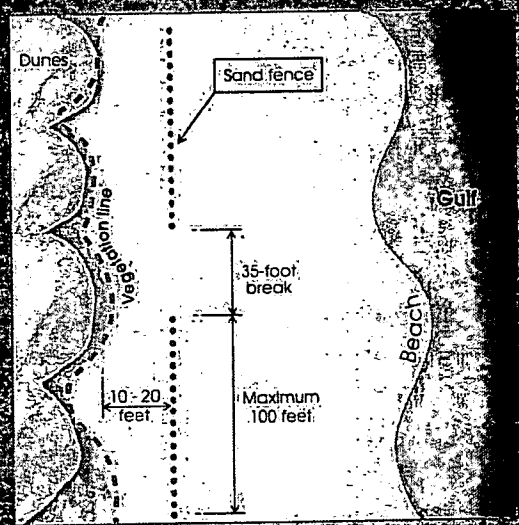


Figure 20. Placement of dune-building structures for repairing damaged foredunes.

Washover and Washout Areas

Dune-building structures should not be erected in washover or washout areas that extend all the way across a barrier island. These areas provide an avenue for the release of excess storm water from the bays, and they channel storm surge from the Gulf that might otherwise destroy dunes. In addition, washovers and washouts sometimes serve as migration routes for finfish and shellfish during storms. They also allow for the transportation of organic matter, an important component of the food chain, to the Gulf during high tides and storms.

A washover or washout that extends only partway across a barrier island can be filled with sand using the procedure described previously under "Breaches or Blowouts." If the sand gulfward of a washout or washover is water-saturated, or if there is standing water in depressions within the eroded area, sand may have to be imported to rebuild the dune.

The procedure described under "Repairing Foredunes" can be used to strengthen and stabilize dunes on either side of washovers and washouts.

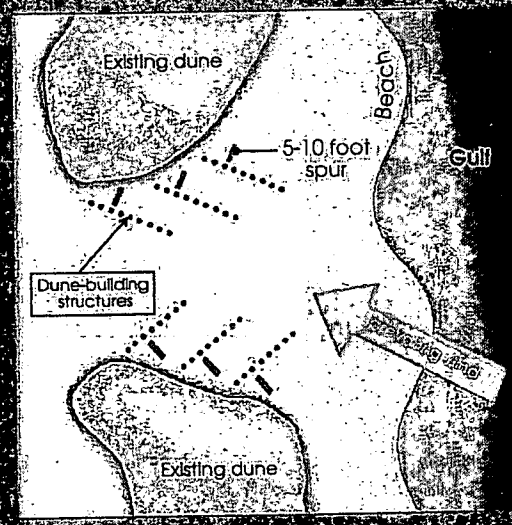


Figure 21. Placement of dune-building structures in washovers or washouts that do not extend across the barrier island.

that extend all the way or partway across barrier islands. Install dune-building structures at the base of the bordering dunes at a 30-45 degree angle to the sides of the washout or washover, facing the prevailing winds (**fig. 21**).

Construction with Imported Sand

Some Texas beaches, particularly along the upper coast, are sand-starved. Natural sand accumulation occurs very slowly, and it may take as long as 20 years for a six-foot-high dune to form. Even with dune-building structures, the process is slow. In areas of limited sand supply, where the sand is saturated, or where it is restrained from blowing, dunes may be constructed of imported sand.

Sand for dune construction must not be taken from the beach. Doing so robs donor areas of the material necessary for maintenance of the beach and dunes, and may increase erosion. Removal of sand and other materials from barrier islands and peninsulas is strictly regulated by state laws (see "Beach Access and Dune Protection Laws"). Sand for dune construction can be obtained from construction-material suppliers or cement companies.

"Beach Access and Dune Protection Laws" Refer to page 23

The salt content of sand used to construct dunes should not exceed four parts per thousand (ppt). Higher salt concentrations will inhibit plant growth. For this reason, freshly dredged spoil material is usually not a good source of sand for dune construction projects. If dredged material is to be used, its salinity can be lowered by allowing it to sit until rain has leached the salt. Depending on the material, this may take from six months to three years. A local soils testing laboratory can conduct salinity tests at a particular location.

Imported sand should be similar in color, grain size, and mineral content to the sand at the dune-building site. If native sand is topped with imported finer sediment, the finer sediment will quickly erode.

Man-made dunes should be of the same general height, slope, width, and shape as the natural dunes in the vicinity. Generally, they should be no less than four feet high with a slope of no more than 45 degrees (a rise of one foot for every one horizontal foot). A slope of about 18.5 degrees (a rise of one foot for every three horizontal feet) is preferred. The initial width of the dune base should be at least 20 feet. A dune with a smaller base will not build to a height sufficient to provide storm protection (**fig. 22**).

Where there is an ample supply of sand, construct dunes slightly landward of the location where foredunes would naturally occur to allow for natural seaward expansion. Dunes built too close to the Gulf can be destroyed by wave action during even minor storms and may interfere with public access along the beach.

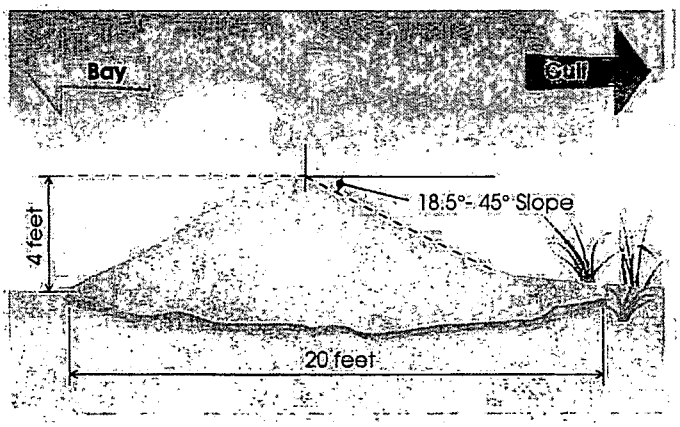


Figure 22. Minimum height, width, and slope of a dune constructed of imported sand.

Shoreline protection structures have been placed along portions of the coastline. While these structures protect property landward of them, they are not considered dunes and should not be used as a method of, or core for, dune restoration. These structures do not provide the same habitat for flora and fauna that dunes do or store and supply sand to the beach system.

DUNE WALKOVERS

Damage to dunes from pedestrian traffic can be avoided by the use of elevated walkovers for access to the beach. If walkovers are conveniently placed near access roads, parking areas, beachfront subdivisions, and public facilities, pedestrians will be less likely to cut footpaths through the dunes. Also, providing walkovers may increase public awareness of the importance of dunes and promote an appreciation of the sensitivity of the dune environment **(fig. 23)**.

A walkover should begin landward of the foredune and extend no farther seaward than the most landward point of the public beach where it will not interfere with public use of the beach at normal high tide. The structure should be oriented at an angle to the prevailing wind direction. Otherwise, wind blowing directly up the path of the walkover may impede the growth of vegetation beneath it, erode sand from the seaward end, and increase the possibility of washout or blowout occurrences.

Construction Standards

Wood is the preferred construction material for walkovers because it is less expensive than metal, does not collect and retain heat as metal does, and is readily adapted to a number of designs. Although there are a few walkovers made from polyvinyl plastic, treated lumber and galvanized nuts and bolts may be used. Basic structural guidelines for walkovers are detailed in **figure 24**.

The width of a walkover should be based on the expected volume of pedestrian traffic. If a walkover will be infrequently used, a width of two feet should be sufficient. Walkovers intended for two-way passage should be wider, perhaps three or four feet. A width of six feet may be appropriate for a walkover subject to heavy use.



Figure 23. Dune walkover.

The structure's height should be at least one to one and a half times its width (three feet minimum) to allow sunlight to reach vegetation underneath. In any case, the deck of the walkover must be of sufficient elevation to accommodate the expected increase in dune height.

Space the slats forming the deck of the walkover 1/2 inch apart so that sunlight and rainfall can penetrate to plants below and so that sand will not accumulate on the deck.

Place the supporting piers as far apart as possible along the length of the structure. A distance of at least six feet between pairs of piers is recommended. Implant the piers at least three feet in the ground to ensure stability. A depth of five feet or more is advisable to allow for erosion around the piers during storms. Install the piers with a hand auger or posthole digger rather than with a tractor. Walkover piers should not be set with cement. Repair damage to the dune area as soon as possible.

Providing handrails on both sides of the walkover is recommended as a safety measure and to discourage people from jumping off into the dunes. Railings are particularly advisable on public walkovers and those that are high above the ground. Railings should be at least three feet high.

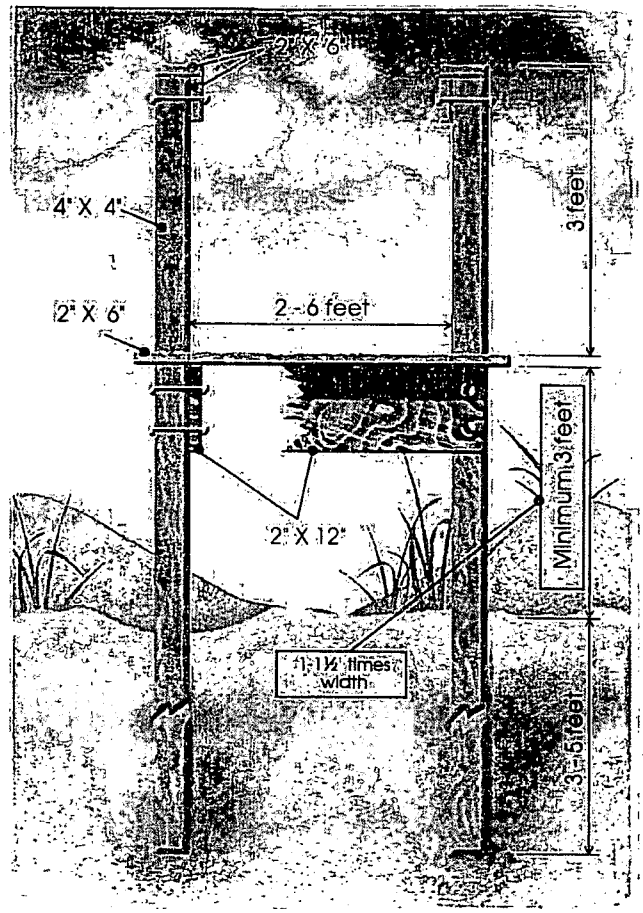


Figure 24. Construction details for a dune walkover.

To enable wheelchair use on a walkover, inclined ramps with a 20 percent slope (a one-foot rise for every five feet in length) may be built at each end of the structure. Ramps are recommended for any large public walkover.

Walkovers should be inspected on a regular basis and promptly repaired as needed. To avoid damage, workers should enter the dune area on foot rather than by vehicle.

Common walkover structures are preferred for subdivisions to minimize damage to dunes by the proliferation of walkovers.

Walkover Designs

Figure 25 A and B show two of the most common designs for dune walkovers in Texas and are variations of the common pier-supported structure employing telephone pole or fence post piers. Design A has a flat deck with steps at each end. Design B has ramps instead of steps, and the deck is arched where dune formations are highest. **Figure 25 C** may be adapted for access over areas that cannot be disturbed. The conventional pier-supported walkover is relatively easy to build, but the services of a qualified contractor or architect may be required for more accommodating designs. Prior to construction, check with the local building inspector for preferred specifications for dune walkovers.

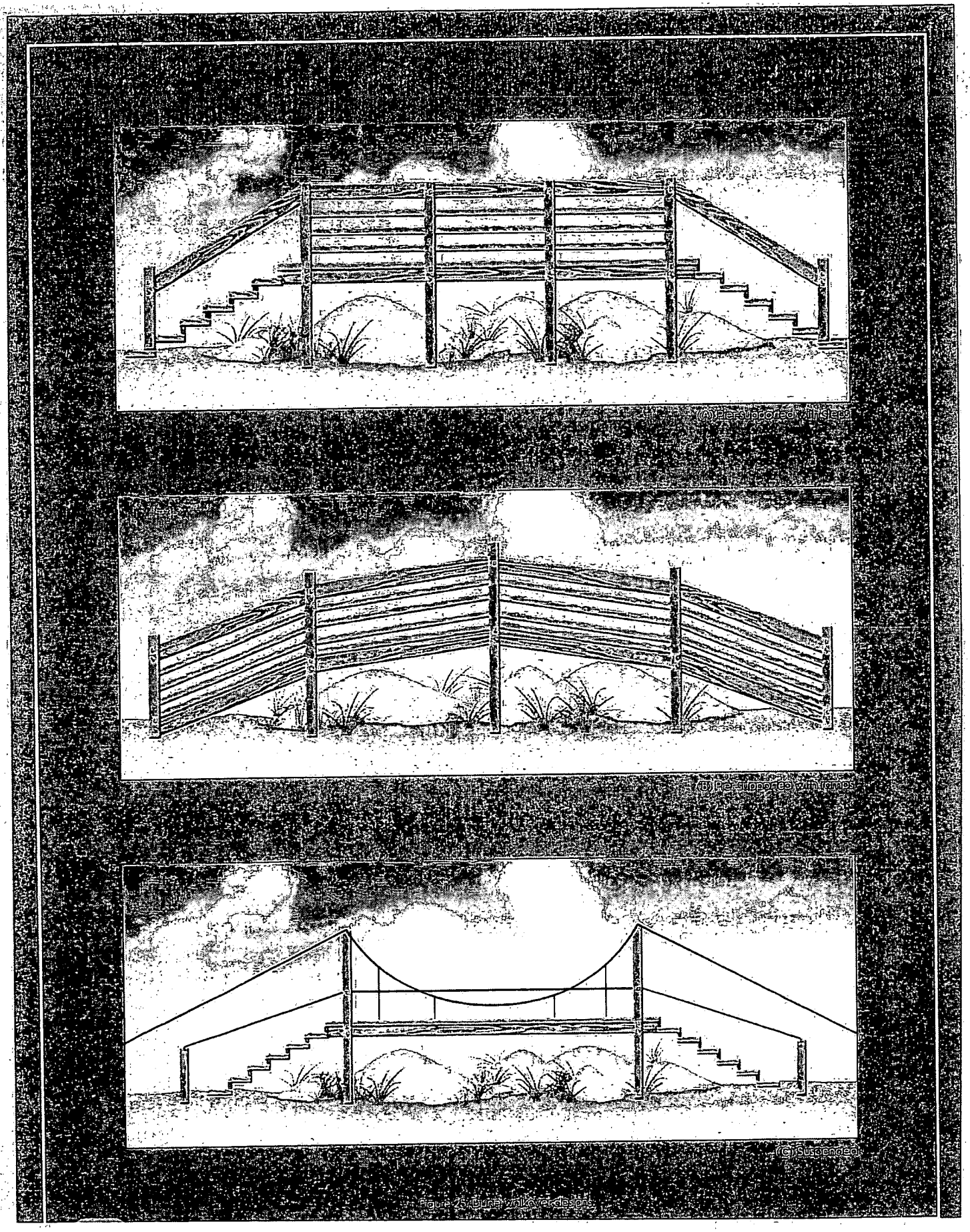


Figure 25 Burn walkover designs

Beach access and Drainage

Access Roads

The need for public roads to provide access to beaches often conflicts with the need to protect dunes; however, damage to dune areas by access roads can be minimized if the roads are properly designed.

Roads constructed parallel to the shoreline should be located as far landward of the dunes as possible. Beach access roads built perpendicular to the beach should be located in washover or blowout areas whenever possible, following natural land contours.

Beach access roads should be oriented at an angle to the prevailing wind direction. This will reduce the chance that water and wind will be channeled along them and erode the dunes at the sides of the road cuts (fig. 26). Access roads near beaches should be elevated (similar to a speed bump) to reduce channelization of water during high tides (fig. 27).

To minimize dune destruction, access roads should be as narrow as practicable. Any dune area damaged during road construction should be revegetated. Sand fencing can be used to retard erosion along the sides of the roads.

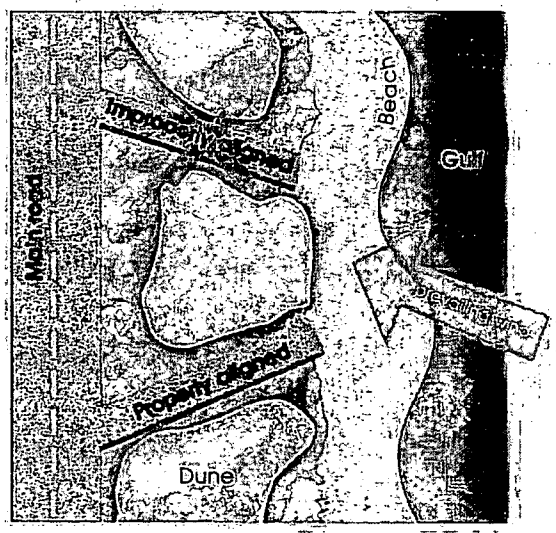


Figure 26. Alignment of beach access roads.

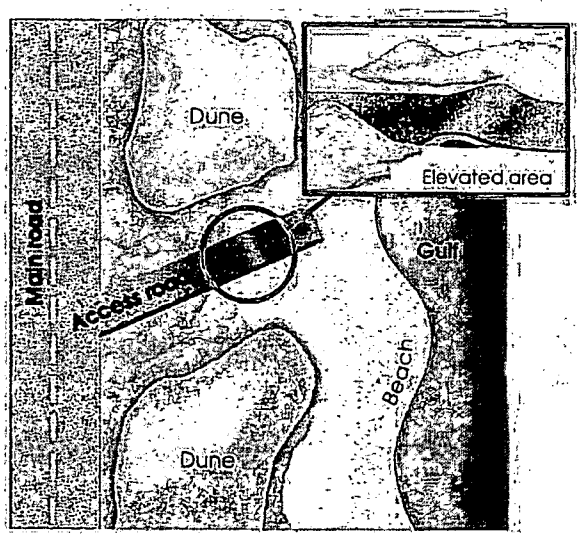


Figure 27. Elevating beach access roads at beach juncture.

Drainage

On an undeveloped barrier island, rainwater generally seeps into the ground or drains toward open water. As an island is developed and land is covered with buildings and pavement, the amount of permeable land surface exposed to absorb rainfall is reduced, and runoff increases. On barrier islands with dense urban development or areas where the contour of the land has been altered, storm runoff does not follow the natural course to the Gulf and can create a washout, resulting in flooding of shorefront property. In addition, the washout exposes land and buildings behind the dunes to further flooding by storm surge.

Drainage patterns resulting from construction must not erode dunes, the public beach, or adjacent properties. General Land Office rules require that new channels be directed inland instead of through critical dunes toward the gulf. Damage to dunes and to property behind them can be prevented or halted by the installation of a retention pond to collect

and contain rainwater until it can seep into the ground. Either man-made or natural swales will serve this purpose. The pond should be large enough to contain the anticipated volume of runoff and located where it will receive the maximum amount of drainage (fig. 28). A qualified professional should design the system and oversee its construction.

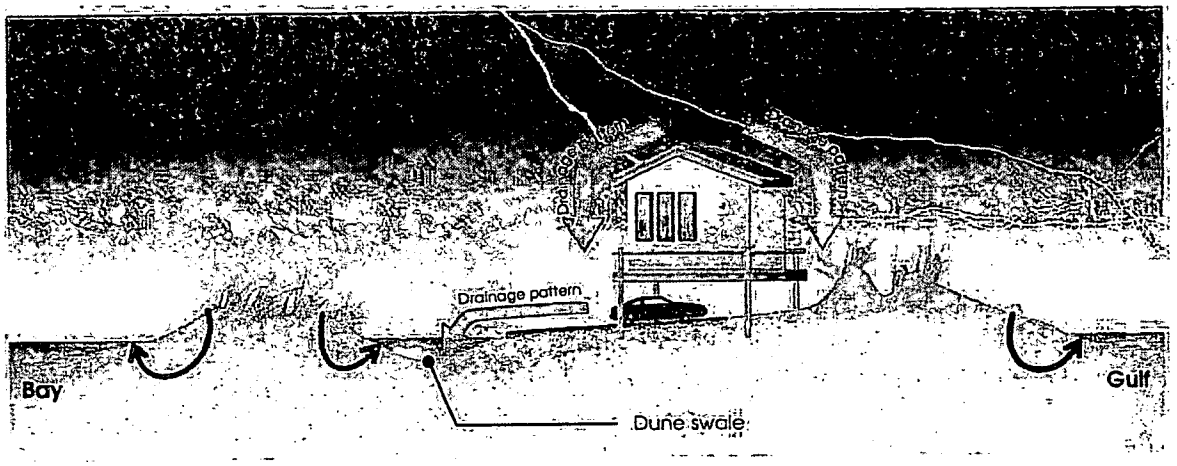


Figure 28. Utilizing a retention pond for drainage.

Beach Access and Dune Protection Laws

Any group or individual planning to undertake a dune protection or improvement project on the Texas coast must be aware of federal, state, and local laws and regulations that apply to the proposed action.

Federal Guidelines

In 1987, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, and the U.S. Department of Agriculture Natural Resources Conservation Service (then the Soil Conservation Service) drafted the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands*. Federal permits must be obtained from the Corps of Engineers for activities in these areas. Jurisdictional wetlands are identified on the basis of plant type, soils, and local hydrology.

In many cases, activities in coastal sand dunes will not affect jurisdictional wetlands and no federal permit will be required; however, seasonally wet swales between dunes may be considered wetlands. Questions regarding jurisdictional wetlands in Texas and procedures for obtaining proper permits can be directed to the local county commissioners court or to the U.S. Army Corps of Engineers, Galveston District (see "Where to Get Help").

The Federal Emergency Management Agency (FEMA) classifies all foredunes as "coastal high-hazard areas," or "high-velocity zones" (V-zones). A "V-zone" is defined as "a special flood hazard area extending from offshore to the inland limit of a foredune along the open coast, and any other area subject to high velocity wave action from storms or seismic sources."

Foredunes are included in V-zones because they absorb the brunt of storm attack. FEMA requires more rigorous construction standards within V-zones and also prohibits "any human-caused alterations of sand dunes which could increase potential flood damage." For more information concerning V-zones, and to obtain flood maps, contact a FEMA representative or your local floodplain coordinator. The Texas Natural Resource Conservation Commission is the FEMA state liaison for the National Flood Insurance Program (see "Where to Get Help").

State Laws

The Open Beaches Act (Chapter 61 of the Texas Natural Resources Code), passed by the Texas Legislature in 1959, codified the public's common law right of free and unrestricted access to the "public beach," which extends from the line of mean low tide to the line of vegetation on the shoreline bordering the Gulf of Mexico. The act makes it unlawful to prevent or impede access to or use of the public beach by erecting barriers or by posting signs declaring a beach closed to the public.

The Texas General Land Office (Land Office) can help determine whether a dune vegetation project, a dune-building structure, a dune walkover, or signs or fencing erected to protect a dune vegetation project site violates the provisions of this act (see "Where to Get Help").

The Dune Protection Act (Sections 63.001-63.181 of the Texas Natural Resources Code), enacted in 1973 and amended by the Texas Legislature in 1991, requires the commissioners court of any county with public beaches bordering on the Gulf of Mexico to establish a dune protection line on the Gulf shoreline. This requirement applies to mainland shoreline fronting the open Gulf as well as to the Gulf shoreline of islands and peninsulas. The county may allow the governing body of a municipality to assume this responsibility within its corporate limits and extraterritorial jurisdiction.

The dune protection line can be established up to 1,000 feet landward of the mean high tide line. A permit from the county commissioners court or city is required for most activities seaward of the line.

Questions about dune regulations should be directed to the county commissioners court, city, the Land Office, or the Attorney General's Office (see "Where to Get Help").

"Where to Get Help" Refer to page 25.

Texas Coastal Management Program

The Texas Coastal Management Program (CMP) contains a series of goals and policies aimed at protecting the Texas coastal environment. Texas receives funding from the federal government for coastal projects and the Land Office administers the grants program for these projects. The CMP directive is to review federal actions, any activity or project, and applications for federal assistance under other federal programs for consistency with the goals and policies of the CMP. CMP guidelines allow the Texas Coastal Coordination Council (CCC) to review coastal projects for consistency. The CCC may review applications for federal assistance, beachfront construction certificates and dune protection permits issued by local governments, funds for dune restoration and walkovers, and local government dune protection and beach access plan certifications.

Coastal Erosion Planning and Response Act

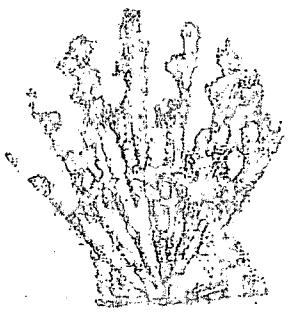
In 1999, the Texas Legislature passed the Coastal Erosion Planning and Response Act (CEPRA) to provide funding to coastal communities for projects that slow the effects of coastal and shoreline erosion. Dune restoration and beach nourishment projects may be funded through this program. Communities may submit proposals to the Land Office for such projects.

Removal of Sediments

Sections 61.211 through 61.227 of the Texas Natural Resources Code regulate the removal of sand, marl, gravel, and shell from islands, peninsulas, and land within 1,500 feet of mainland public beaches outside corporate limits. A permit must be obtained from the relevant county commissioners court for the excavation of any of these materials unless the material is to be moved by a landowner, or with a landowner's consent, from one location to another on the same piece of property. No permit is required if the removal is officially undertaken by a federal, state, or local governmental entity. An incorporated city, town, or village may not authorize the removal of sand, marl, gravel, or shell from a public beach within its boundaries for any purpose other than the construction of a public-sponsored recreational facility or a shoreline protection structure.

The Texas Parks and Wildlife Department, under Chapter 86 of the Parks and Wildlife Code, regulates the disturbance and removal of marl, sand, gravel, shell, or mudshell located within tidewater areas for any purpose other than that necessary or incidental to navigation or dredging under state or federal authority. Questions may be directed to this department (see "Where to Get Help").

"Where to Get Help" Refer to page 25



WHERE TO GET HELP

FEDERAL

For construction standards in floodplains and coastal high velocity zones:

★Federal Emergency Management Agency, Region VI
Federal Center
800 N. Loop 288
Denton, Texas 76201-3698
(800) 424-8802
www.fema.gov

For information on permitting in jurisdictional wetlands:

★U.S. Army Corps of Engineers
Galveston District
P.O. Box 1229
Galveston, Texas 77553-1229
(409) 766-3004
www.swg.usace.army.mil

Corps of Engineers - Corpus Christi
5151 Flynn Parkway, Suite 306
Corpus Christi, Texas 78411
(361) 814-5847

For technical assistance in designing a dune restoration project:

★U.S. Department of Agriculture
Natural Resources Conservation Service
101 S. Main Street
Temple, Texas 76501-7682
(817) 774-1261
www.tx.nrcs.usda.gov

★Kika de la Garza Plant Materials Center
3409 N. FM 1355
Kingsville, Texas 78363
(361) 595-1313
john.reilly@tx.usda.gov

STATE

For information on permitting coastal construction:

★Texas General Land Office
Coastal Resources
P.O. Box 12873
Austin, Texas 78711-2873
(800) 998-4GLO
www.glo.state.tx.us

Texas GLO - Upper Coast
11811 North D Street
La Porte, Texas 77571
(281) 470-1191
(281) 470-8071 fax

Texas GLO - Middle/Lower Coast
6300 Ocean Drive, Ste. 2400
Corpus Christi, Texas 78412
(361) 825-3030
(361) 825-3040

★Coastal Coordination Council
Permit Service Center
Texas A&M University-Corpus Christi
Natural Resources Building
Suite 2800
6300 Ocean Drive
Corpus Christi, Texas 78412-5599
(866) 894-3578

For information on sand, marl and gravel removal from tidal waters:

★Texas Parks and Wildlife Department
Resource Protection Division
4200 Smith School Road
Austin, Texas 78744-3292
(512) 389-4864
www.tpwd.state.tx.us

For information on the state's floodplain maps:

★Texas Commission on Environmental Quality
Floods and Floodplains
P.O. Box 13087
Austin, Texas 78711-3087
(512) 239-4771
www.tceq.state.tx.us

COASTAL COUNTIES

Coastal counties that administer dune protection and beachfront construction programs:

★JEFFERSON COUNTY
County Engineer
Jefferson County Courthouse
1149 Pearl Street, 5th floor
Beaumont, Texas 77701-3619
(409) 835-8584

★CHAMBERS COUNTY
Floodplain Administrator
P.O. Drawer H
Anahuac, Texas 77514-1708
(409) 267-8379

GALVESTON COUNTY
Asst. Floodplain Administrator
123 Rosenberg, Suite 4157
Galveston, Texas 77550-1403
(409) 770-5552

BRAZORIA COUNTY
County Floodplain Administrator
200 E. Locust, Room 8
Angleton, Texas 77515-4684
(979) 849-5711

MATAGORDA COUNTY
Floodplain Management
2200 7th Street
Bay City, Texas 77414-0571
(979) 244-2717

NUECES COUNTY
County Engineer
901 Leopard St., Suite 103
Corpus Christi, Texas 78401-3697
(361) 888-0490

CAMERON COUNTY
Director
Cameron County Park Systems
P.O. Box 2106
South Padre Island, Texas 78597-2106
(956) 761-5493

COASTAL MUNICIPALITIES

Coastal municipalities that administer dune protection and beachfront construction programs:

CITY OF PORT ARTHUR
Director of Planning
P.O. Box 1089
Port Arthur, Texas 77641-1089
(409) 983-8138

CITY OF GALVESTON
Director of Planning and
Community Development
823 Rosenberg, Room 401
Galveston, Texas 77550-2198
(409) 797-3660

VILLAGE OF JAMAICA BEACH
City Administrator
P.O. Box 5264
Jamaica Beach, Texas 77554-5264
(409) 737-1142

VILLAGE OF SURFSIDE BEACH
Mayor
1304 Monument Drive
Surfside Beach, Texas 77541-9999
(979) 233-1531, ext. 4

TOWN OF QUINTANA
Mayor
814 N. Lamar
Quintana, Texas 77541
(979) 233-0848

CITY OF PORT ARANSAS
City Manager
P.O. Box 1090
Port Aransas, Texas 78373-1090
(361) 749-4111

CITY OF CORPUS CHRISTI
Director of Planning and
Development
Planning Department
P.O. Box 9277
Corpus Christi, Texas 78469-9277
(361) 880-3560

TOWN OF SOUTH PADRE ISLAND
Department of Public Works
P.O. Box 3410
South Padre Island, Texas 78597-3410
(956) 761-1025

OTHER SOURCES OF VEGETATION INFORMATION

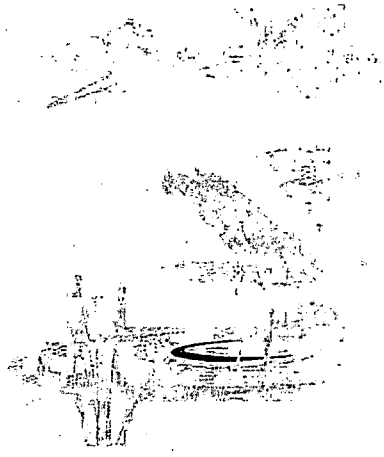
For native plant information:

Lady Bird Johnson
National Wildflower Center
4801 La Crosse Avenue
Austin, TX 78739-1702
(512) 292-4200
www.wildflower.org

For native dune plant availability:

Texas A&M University-Galveston
Marine Biology Department
Galveston, Texas 77553-1675
(409) 740-4528
www.tamug.tamu.edu/mars/

Apache Ecological Service
27426 Dobbin Hufsmith Road
Magnolia, Texas 77354
(281) 356-3135
www.apacheco.com



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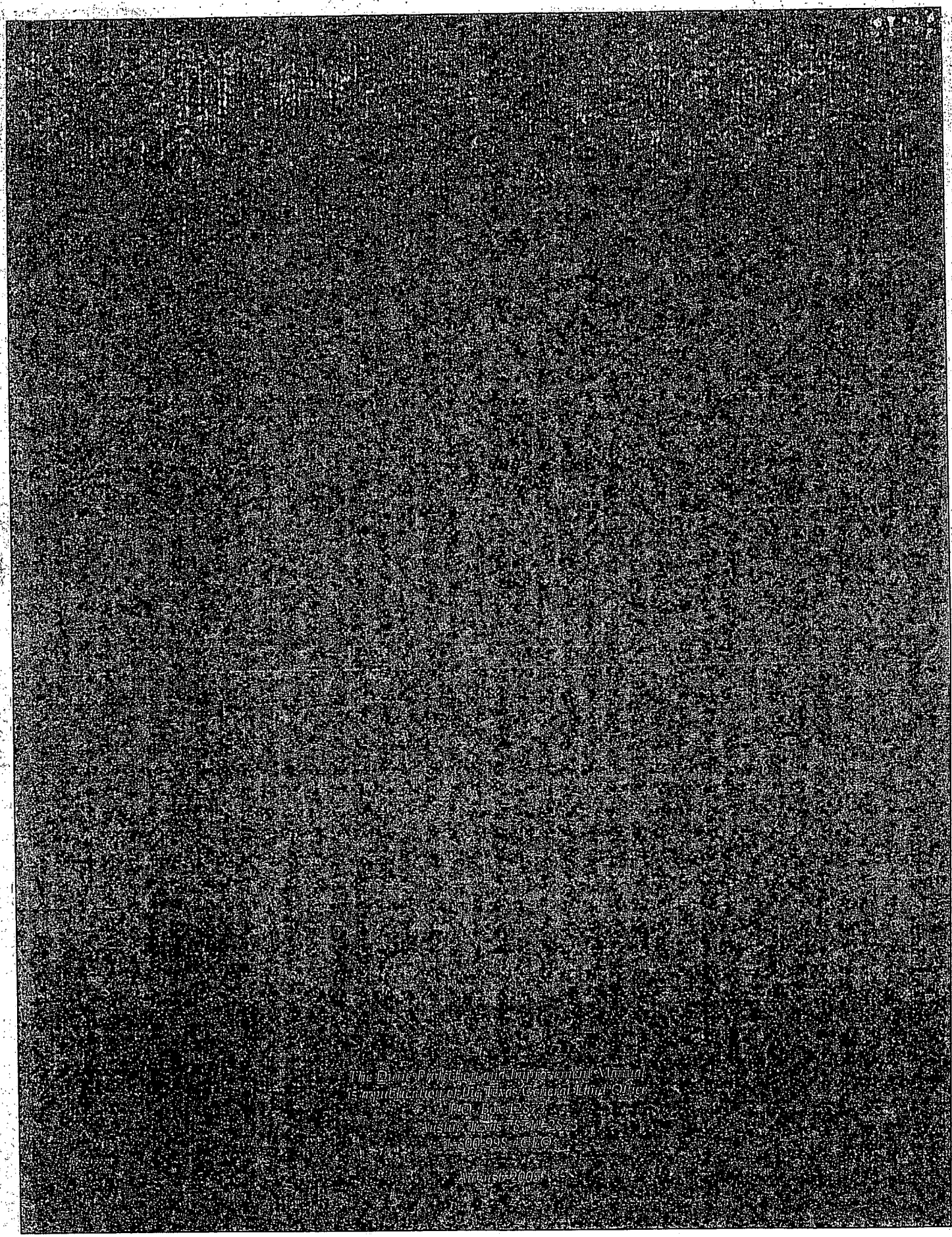
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Maintaining the Building

This chapter provides guidance on maintaining the building structure and envelope.

For maximum performance of a building in a coastal area, the building structure and envelope (i.e., exterior doors, windows, skylights, exterior wall coverings, soffits, roof systems, and attic vents) must not be allowed to deteriorate. Significant degradation by corrosion, wood decay, termite attack, or weathering increases the building's vulnerability to damage from natural hazards. Figure 14-1 shows a post that appears on the exterior to be in

CROSS REFERENCE

or resources that augment the guidance and other information in this Manual, see the Residential Coastal Construction Web site (http://www.fema.gov/rebuild/mat/fema55.shtm).

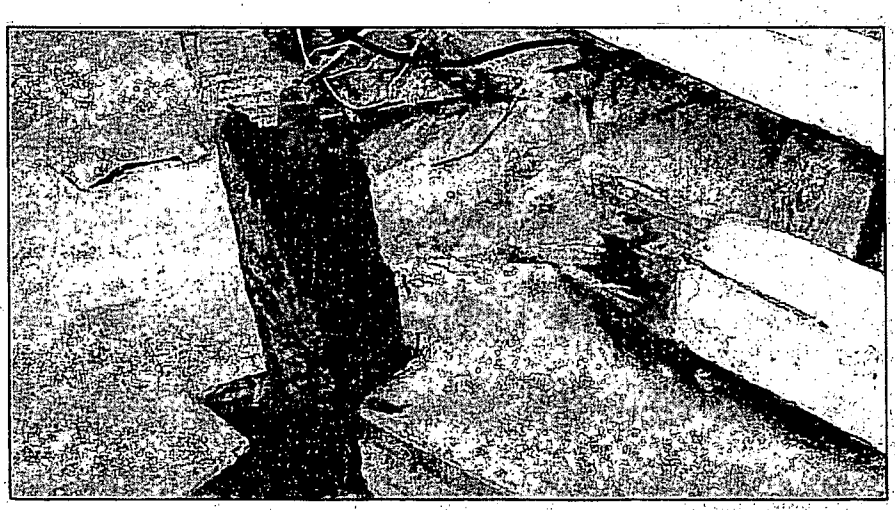


Figure 14-1.
Pile that appears acceptable from the exterior but has interior decay

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PLAINTIFF'S EXHIBIT
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acceptable condition but is weakened by interior decay, which can be determined only through a detailed inspection. This post failed under the loads imposed by a natural hazard event.



COST CONSIDERATION

Maintenance and repair costs are related directly to original design decisions, materials selection, and construction methods.

Long-term maintenance and repair demands are influenced directly by decisions about design, materials, and construction methods during building design and construction. Using less durable materials will increase the frequency and cost of required maintenance and repair. The design and detailing of various building systems (e.g., exposed structural, window, or roof systems) also significantly influence maintenance and repair demands.

14.1 Effects of Coastal Environment

The coastal environment can cause severe damage to the building structure and envelope. The damage arises primarily from salt-laden moisture, termites, and weathering.

14.1.1 Corrosion

The corrosive effect of salt-laden, wind-driven moisture in coastal areas cannot be overstated. Salt-laden, moist air can corrode exposed metal surfaces and penetrate any opening in the building. The need to protect metal surfaces through effective design and maintenance (see Section 14.2.6 for maintenance of metal connectors) is very important for the long-term life of building elements and the entire building. Stainless steel is recommended because many galvanized (non-heavy-gauge) products and unprotected steel products do not last in the harsh coastal environment.



CROSS REFERENCE

For additional information on corrosion, see Section 9.4.5 in this Manual and FEMA Technical Bulletin 8-96, *Corrosion Protection of Metal Connectors in Coastal Areas for Structures Located in Special Flood Hazard Areas* (FEMA 1996).

Corrosion is most likely to attack metal connectors (see Section 14.2.6) that are used to attach the parts of the structure to one another, such as floor joists to beams and connectors used in cross-bracing below the finished lowest floor. Galvanized connectors coated with zinc at the rate of 0.9 ounce per square foot of surface area (designated G-90) can corrode in coastal environments at a rate of 0.1 to 0.3 millimeter/year. At this rate, the zinc protection will be gone in 7 years. A G-185 coated connector, which provides twice as much protection as G-90, can corrode in less than 20 years. More galvanized protection (more ounces of zinc per square foot of surface area to be protected) increases service life.

Corrosion can also affect fasteners for siding and connectors for attaching exterior-mounted heating, ventilation, and air-conditioning units, electrical boxes, lighting fixtures, and any other item mounted on the exterior of the building. These connectors (nails, bolts, and screws) should be stainless steel or when they must be replaced, replaced with stainless steel. These connectors are small items, and the increased cost of stainless steel is small.

14.1.2 Moisture

There are many sources of exterior moisture from outside the home in the coastal environment. Whenever an object absorbs and retains moisture, the object may decay, mildew, or deteriorate in other ways. Figure 14-2 shows decay behind the connection plate on a beam.

Significant sources of interior moisture, such as kitchens, baths, and clothes dryers, should be vented to the outside in such a way that condensation does not occur on interior or exterior surfaces.



Figure 14-2. Wood decay behind a metal beam connector

Connectors should be designed to shed water to prevent water from accumulating between the connector and the material the connector is attached to. Trapped moisture increases the moisture content of the material and potentially leads to decay. Moisture is most likely to enter at intersections of materials where there is a hole in the building envelope (e.g., window, door) of where two surfaces are joined (e.g., roof to wall intersection). If properly installed, the flashings for the openings and intersections should not require maintenance for many years. However, flashings are frequently not properly installed or installed at all, creating an ongoing moisture intrusion problem.

The potential for wood framing in crawlspaces in low-lying coastal areas to decay is high. Moisture migration into the floor system can be reduced if the floor of the crawlspace is covered with a vapor barrier of at least 6-millimeter polyethylene. Where required by the local building code, wood framing in the crawlspace should be preservative-treated or naturally decay-resistant. The building code may have ventilation requirements.

Many existing crawlspaces are being converted to "conditioned crawlspaces." A moisture barrier is placed on the floor and walls of the crawlspace interior, insulation is added to the floor system (commonly sprayed-on polyurethane foam), and conditioned air is introduced into the space. In order for a conditioned crawlspace to be successful in low-lying coastal areas, moisture control must be nearly perfect so that the moisture content of the floor system does not exceed 20 percent (the minimum water content in wood that promotes mold growth). Conditioned crawlspaces are typically not practical in a floodplain where flood vents are required.

Sprinkler systems used for landscaping and other exterior water distribution systems (e.g., fountains) must be carefully tested so they do not create or increase water collection where metal connectors are fastened. Water collection can be prevented easily during installation of the exterior water distribution system by making sure the water distribution pattern does not increase the moisture that is present in the building materials.

14.1.3 Weathering

The combined effects of sun and water on many building materials, particularly several types of roof and wall coverings, cause weathering damage, including:

- Fading of finishes
- Accelerated checking and splitting of wood
- Gradual loss of thickness of wood
- Degradation of physical properties (e.g., embrittlement of asphalt shingles)

In combination, the effects of weathering reduce the life of building materials unless they are naturally resistant to weathering or are protected from it, either naturally or by maintenance. Even finishes intended to protect exterior materials fade in the sun, sometimes in only a few years.

14.1.4 Termites

The likelihood of termite infestation in coastal buildings can be reduced by maintenance that makes the building site drier and otherwise less hospitable to termites, specifically:

- Storing firewood and other wood items that are stored on the ground, including wood mulch, well away from the building
- Keeping gutters and downspouts free of debris and positioned to direct water away from the building
- Keeping water pipes, water fixtures, and drainpipes in good repair
- Avoiding dampness in crawlspaces by providing adequate ventilation or installing impervious ground cover membranes
- Avoiding frequent plant watering adjacent to the house and trimming plants away from the walls

If any wood must be replaced under the house in or near contact with the ground, the new wood should be treated. Removing moisture and treating the cellulose in wood, which is the termite's food source, are the most frequently used remedies to combat termites.

14.2 Building Elements That Require Frequent Maintenance

To help ensure that a coastal building is properly maintained, this Manual recommends that buildings be inspected annually by professionals with the appropriate expertise. The following building elements should be inspected annually:

- Building envelope – wall coverings, doors, windows, shutters, skylights, roof coverings, soffits, and attic vents
- Foundation, attic, and the exposed structural frame
- Exterior-mounted mechanical and electrical equipment

Table 14-1 provides a maintenance inspection checklist. Items requiring repair or replacement should be documented and the required work scheduled.

Table 14-1. Maintenance Inspection Checklist

Item	Element	Condition			Repair/Replace	
		Good	Fair	Poor	Yes	No
Foundation	**Wood pile** – decay, termite infestation, severe splits, connection to framing					
	Sill plates – deterioration, splits, lack of attachment to foundation					
	Masonry – deteriorated mortar joints, cracked block, step cracks indicating foundation settlement					
	Concrete – spalling, exposed or corroding reinforcing steel, ≥ 1/4-inch vertical cracks or horizontal cracks with lateral shift in the concrete across the crack					
Exterior Walls	**Siding** – deterioration, nail withdrawal, discoloration, buckling, attachment to studs (nails missing, withdrawn, or not attached to studs), sealant cracked/dried out					
	Trim – deterioration, discoloration, separation at joints, sealant cracked/dried out					
Porches/ Columns	**Top and bottom connections to framing** – corrosion in connectors					
	Base of wood columns – deterioration					
Floors	**Joists or beams** – decay, termite infestation, corrosion at tiedown connectors, splits, excessive holes or notching, excessive sagging					
	Sheathing – deterioration, "squeaky" floors, excessive sagging, attachment to framing (nails missing, withdrawn, or not attached to framing)					

Table 14-1. Maintenance Inspection Checklist (concluded)

Item	Element	Condition			Repair/Replace	
		Good	Fair	Poor	Yes	No
Floors	**Sheathing under floors** – attachment to framing, nail corrosion fastening sheathing to floor joists, buckling/warping caused by excessive moisture					
Windows/ Doors	**Glazing** – cracked panes, condensation between panes of insulated glass, nicks in glass surface, sealant cracked/dried out					
	Trim – deterioration, discoloration, separation at joints, caulking dried out or separated					
	Shutters – permanent shutters should be operated at least twice/year and temporary panels should be checked once/year for condition					
Roof	**Asphalt shingles** – granule loss, shingles curled, nails withdrawing from sheathing, de-bonding of tabs along eaves and corners					
	Wood shakes – splits, discoloration, deterioration, moss growth, attachment to framing (nails missing, withdrawn, or not attached to framing)					
	Metal – corrosion, discoloration, connection of fasteners or fastening system adequacy					
	Flashings – corrosion, joints separated, nails withdrawing					
Attic	**Framing** – condition of truss plates sagging or bowed rafters or truss chords, deterioration of underside of roof sheathing, evidence of water leaks, adequate ventilation					

Other items that should be inspected include cavities through which air can freely circulate (e.g., above soffits and behind brick or masonry veneers) and, depending on structural system characteristics and access, the structural system. For example, painted, light-gauge, cold-formed steel framing is vulnerable to corrosion, and the untreated cores of treated timber framing are vulnerable to decay and termite damage. Depending on visual findings, it may be prudent to determine the condition of concealed items through nondestructive or destructive tests (e.g., test cuts).

The following sections provide information on the building elements that require frequent maintenance in coastal environments: glazing, siding, roofs, outdoor mechanical and electrical equipment, decks and exterior wood, and metal connectors.

14.2.1 Glazing

Glazing includes glass or a transparent or translucent plastic sheet in windows, doors, skylights, and shutters. Glazing is particularly vulnerable to damage in hurricane-susceptible coastal areas because high winds create wind-borne debris that can strike the glazing. Maintenance suggestions for glazing include the following:

- Checking glazing gaskets/sealants for deterioration and repairing or replacing as needed. Broken seals in insulated glass are not uncommon in coastal areas.
- Checking wood frames for decay and termite attack, and checking metal frames for corrosion. Frames should be repainted periodically (where appropriate), and damaged wood should be replaced. Maintaining the putty in older wood windows minimizes sash decay. Metal frames should be cleaned of corrosion or pitting and the operation of the windows tested on some frequency.
- Checking vinyl frames for cracks especially in the corners and sealing any cracks with a sealant to prevent water entry into the window frame. Vinyl may become discolored from the ultraviolet (UV) rays of the sun.
- Checking for signs of water damage (e.g., water stains, rust streaks from joints) and checking sealants for substrate bond and general condition. Repair or replace as needed.
- Checking glazing for stress cracks in corners. Stress cracks might be an indication of either settlement of the house or of lateral movement that is causing excessive stress in the lateral load system.
- Checking shutters for general integrity and attachment and repainting periodically where appropriate.
- Replacing or strengthening the attachment of the shutter system to the building as appropriate.
- Checking the shutters for ease of operation. Sand can easily get into the hinges and operators and render shutters inoperable.
- Checking locks and latches frequently for corrosion and proper operation. Lock mechanisms are vulnerable to attack by salt-laden air. Applying a lubricant or rust inhibitor improves the operation of these mechanisms over the short term.
- Installing double hung and awning windows, which generally perform better than sliding or jalousie windows in the coastal environment, primarily because the sliding and jalousie windows allow more water, sand, and air infiltration because of the way the windows open and close.
- Replacing sliding and jalousie windows to reduce infiltration.

14.2.2 Siding

Solar UV degradation occurs at a rate of about 1/16 inch over 10 years on exposed wood. This rate of degradation is not significant for dimension lumber, but it is significant for plywood with 1/8-inch veneers. If the exterior plywood is the shearwall sheathing, the loss will be significant over time. Maintenance suggestions for siding materials include the following:

- Protecting plywood from UV degradation with pigmented finishes rather than clear finishes. Pigmented finishes are also especially recommended for exposed shearwall sheathing.
- Protecting wood siding with a protective sealant—usually a semi-transparent stain or paint. The coating should be re-applied regularly because the degradation will occur nearly linearly if re-application is done but will progress faster if allowed to weather with no regular sealing.
- Keeping siding surfaces free of salt and mildew and washing salt from siding surfaces not washed by rain, taking care to direct the water stream downward. Mildew should be washed as needed from siding using commercially available products or the homemade solution of bleach and detergent described in Finishes for Exterior Wood: Section, Application and Maintenance (Williams et al. 1996). Power washing is another technique to keep the siding clean as long as the siding sealant is not removed. Mildew grows on almost any surface facing north, no matter how small the surface.
- Caulking seams, joints, and building material discontinuities with a sealant intended for severe exterior exposures and renew the sealant every 5 years at a minimum or when staining or painting the siding and trim. Sealant applied at large wood members should be renewed about 1 year after the wood has shrunk away from the caulked joint.
- Caulking carefully to avoid closing off weep or water drainage holes below windows or in veneers that are intended to drain will prevent sealing the moisture inside the wall cavity, which can lead to significant, long-term deterioration.
- Renailing siding when nails withdraw (pop out) and renailing at a new location so the new nail does not go into the old nail hole.
- Ensuring vinyl siding has the ability to expand and contract with temperature changes. Buckling in the siding is an indication that the siding was installed too tightly to the wall sheathing with an insufficient amount of room under the siding nails to allow for the normal horizontal movement of the siding.

14.2.3 Roofs

Roof coverings are typically the building envelope material most susceptible to deterioration from weathering. Also, depending on roof system design, minor punctures or tears in the roof covering can allow water infiltration, which can lead to serious damage to the roof system and other building elements. Maintenance suggestions for roof materials include the following:

- Checking the general condition of the roof covering. Granule loss from asphalt shingles is always a sign of some deterioration, as is curling and clawing (reverse curling) although some minor loss is expected even from new shingles.
- Dabbing roofing cement under the tabs of the first layer of shingles, including the base course, to help ensure that this layer stays down in high winds.
- Dabbing roofing cement under any shingle tabs that have lifted up from the existing tack strip.
- Checking the nails that attach the shingles to the roof for corrosion or pullout.
- Checking metal flashings and replacing or repairing as necessary.
- Cleaning dirt, moss, leaves, vegetative matter, and mildew from wood shakes.

- Cleaning corroded surfaces of ferrous metal roofs and applying an appropriate paint or sealer.
- Checking the attachment of the roof surface to the deck. Screws and nails can become loose and may require tightening. Gasketed screws should be added to tighten the metal deck to the underlayment. Some roofing systems are attached to the underlayment with clips that can corrode—these clips should be inspected and any corroded clips replaced, but in many cases, the clips will be concealed and will require some destructive inspection to discover the corroded clips.
- Removing debris from the roof and ensuring that drains, scuppers, gutters, and downspouts are not clogged.
- Removing old asphalt shingles before recovering. This is recommended because installing an additional layer of shingles requires longer nails, and it is difficult to install the new asphalt shingles so that they lay flat over the old. New layers installed over old layers can therefore be susceptible to wind uplift and damage, even in relatively low wind speeds. New layers installed over old shingles could void the warranty for the new shingles.
- Checking attachments of eave and fascia boards. Deterioration in these boards will likely allow flashings attached to them to fail at lower than design wind speeds.

14.2.4 Exterior-Mounted Mechanical and Electrical Equipment

Most outdoor mechanical and electrical equipment includes metal parts that corrode in the coastal environment. Life expectancy improves if the salt is washed off the outside of the equipment frequently. This occurs naturally if the equipment is fully exposed to rainwater, but partially protected equipment is subject to greater corrosion because of the lack of the natural rinsing action.

Using alternative materials that do not include metal parts can also help reduce the problems caused by corrosion. In all cases, electrical switches should be the totally enclosed type to help prevent moisture intrusion into the switch, even if the switch is located on a screened porch away from the direct effects of the weather. Building owners should expect the following problems in the coastal environment:

- Electrical contacts can malfunction and either short out or cause intermittent operation
- Housings for electrical equipment, heating, ventilation, and air-conditioning condensers, ductwork, and other elements deteriorate more rapidly
- Fan coils for outside condensers can deteriorate more rapidly unless a coastal environment is specified
- Typical metal fasteners and clips used to secure equipment can deteriorate more rapidly in a coastal environment than a non-coastal environment

14.2.5 Decks and Exterior Wood

The approach to maintaining exterior wood 2x members is different from the approach for thicker members. The formation of small checks and splits in 2x wood members from cyclical wetting and drying can be reduced by using water-repellent finishes. The formation of larger checks and splits in thicker wood members is caused more by long-term drying and shrinking and is not as significantly reduced by the

use of water-repellent finishes. Installation of horizontal 2x members with the cup (concave surface) down minimizes water retention and wood deterioration.

- Cyclical wetting and drying, such as from dew or precipitation, causes the exterior of a wood member to swell and shrink more quickly than the interior. This causes stress in the surface, which leads to the formation of checks and splits. This shrink-swell cycling is worst on southern and western exposures. Checks and splits, especially on horizontal surfaces, provide paths for water to reach the interior of a wood member and remain, where they eventually cause decay. Maintaining a water-repellent finish, such as a pigmented paint, semi-transparent stain, or clear finish, on the wood surface can reduce the formation of checks and splits. These finishes are not completely water- or vapor- repellent, but they significantly slow cyclical wetting and drying. Of the available finishes, pigmented paints and semi-transparent stains have the longest lifetime; clear finishes must be reapplied frequently to remain effective. Matte clear finishes are available that are almost unnoticeable on bare wood. These finishes are therefore attractive for decking and other "natural" wood, but they must be renewed when water no longer beads on the finished surface.

- Wood deck surfaces can be replaced with synthetic materials, which are sold under a variety of trade names. Many of these products should be attached with stainless screws or hidden clips to preservative-treated framing.

- Moisture-retaining debris can collect between deck boards and in the gaps in connections. Periodic cleaning of this debris from between wood members, especially at end grains, allows drying to proceed and inhibits decay.

- Larger timbers can also be vulnerable to checks, splits, and other weather-related problems. The best way to maintain larger timbers is to keep water away from joints, end grain surfaces, checks, and splits. Much can be learned by standing under the house (given sufficient headroom) during a rain with the prevailing wind blowing to see where the water goes. Measures, such as preservative treatments, can then be taken or renewed to minimize the effect of this water on the larger timbers.

- Connections of deck band boards to the structure should be inspected periodically for moisture intrusion. These connections frequently leak from wind-driven rain and moisture accumulation. Leakage can occur at the flashing to structure interface or at the bolts connecting the band board to the structure.

14.2.6 Metal Connectors

Most sheet-metal connectors, such as tiedown straps, joist hangers, and truss plates used in structural applications in the building, should be specified to last the lifetime of the building without the need for maintenance. However, the use of corrosion-prone connectors is a common problem in existing coastal houses.

- Galvanized connectors may have corrosion issues. If galvanized connectors remain gray, the original strength is generally unaffected by corrosion. When most of the surface of the connector turns rust red, the sacrificial galvanizing has



CROSS REFERENCE

The selection of metal connectors for use within the building envelope and in exposed locations is addressed in Section 9.4 of this Manual.

been consumed and the corrosion rate of the unprotected steel can be expected to accelerate by up to a factor of 50 times. Figure 14-3 illustrates severe corrosion under an exterior deck.

- Sheet-metal connectors can be susceptible to rapid corrosion and are frequently without reserve strength. During routine inspections, any sheet-metal connectors found to have turned rust red or to show severe, localized rusting sufficient to compromise their structural capacity should be replaced immediately. However, the replacement of sheet metal connectors is usually difficult for a number of reasons: the connection may be under load, the nails or bolts used to secure connectors are usually hard to remove, and the location of a connector often makes removal awkward.
- Salt-laden air can increase corrosion rates in building materials. Covering exposed connectors with a sheathing material reduces their exposure and therefore increases their life expectancy.



WARNING

Using corrosion-prone sheet metal connectors increases maintenance requirements and potentially compromises structural integrity.

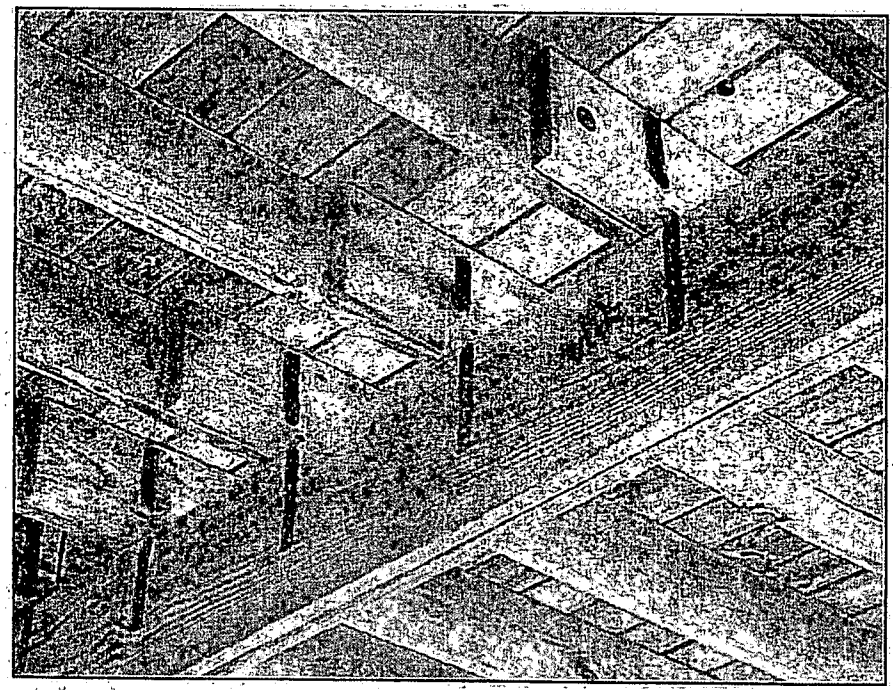


Figure 14-3. Severely corroded deck connectors

14.3 Hazard-Specific Maintenance Techniques

The maintenance practices described above for minimizing corrosion, wood decay, termite infestation, and UV degradation will improve the resistance of a coastal building to flood, wind, and seismic damage by maintaining the strength of the structural elements. The additional measures described in the following sections will further maintain the building's resistance to natural hazards.

14.3.1 Flooding

When designing for the lateral force capacity of an unbraced or braced pile foundation, the designer should allow for a certain amount of scour. Scour in excess of the amount allowed for reduces the embedment of the piles and causes them to be overstressed in bending during the maximum design flood, wind, or earthquake. As allowed by local regulations and practicality, the grade level should be maintained at the original design elevation.

Scour and long-term beach erosion may affect pile maintenance requirements. If tidal wetting was not anticipated in the original design, the piles may have received the level of preservative treatment required only for ground contact and not the much higher marine treatment level that provides borer resistance. If the pile foundation is wetted by high tides or runup, borer infestation is possible. Wrapping treatments that minimize borer infestation are available for the portions of the piles above grade that are subject to wetting.

14.3.2 Seismic and Wind

Many seismic and wind tiedowns at shearwall vertical chords use a vertical threaded rod as the tension member. Each end of the threaded rod engages the tiedown hardware or a structural member. Over time, cross-grain shrinkage in the horizontal wood members between the threaded rod connections loosens the threaded rod, allowing more rocking movement and possible damage to the structure. Whenever there is an opportunity to access the tiedowns, the nuts on the rods should be tightened firmly. New proprietary tiedown systems that do this automatically are available.

Shearwall sill plates bearing directly on continuous footings or concrete slabs-on-grade, if used in coastal construction, are particularly susceptible to decay in moist conditions. Figure 14-4 shows a deteriorated sill plate. Even if the decay of the preservative-treated sill plate is retarded, the attached untreated plywood can easily decay and the shearwall will lose strength. Conditions that promote sill and plywood decay include an outside soil grade above the sill, stucco without a weep screed at the sill plate, and sources of excessive interior water vapor. Correcting these conditions helps maintain the strength of the shearwalls.

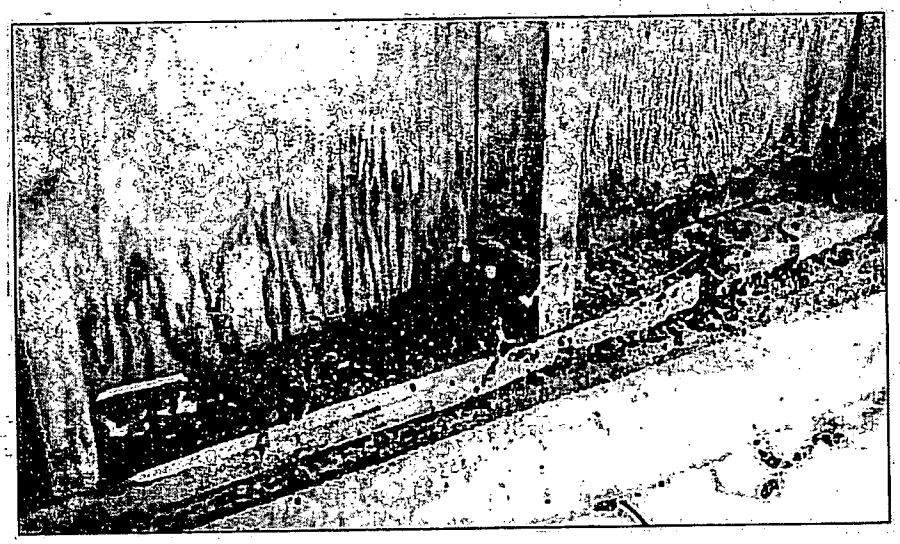


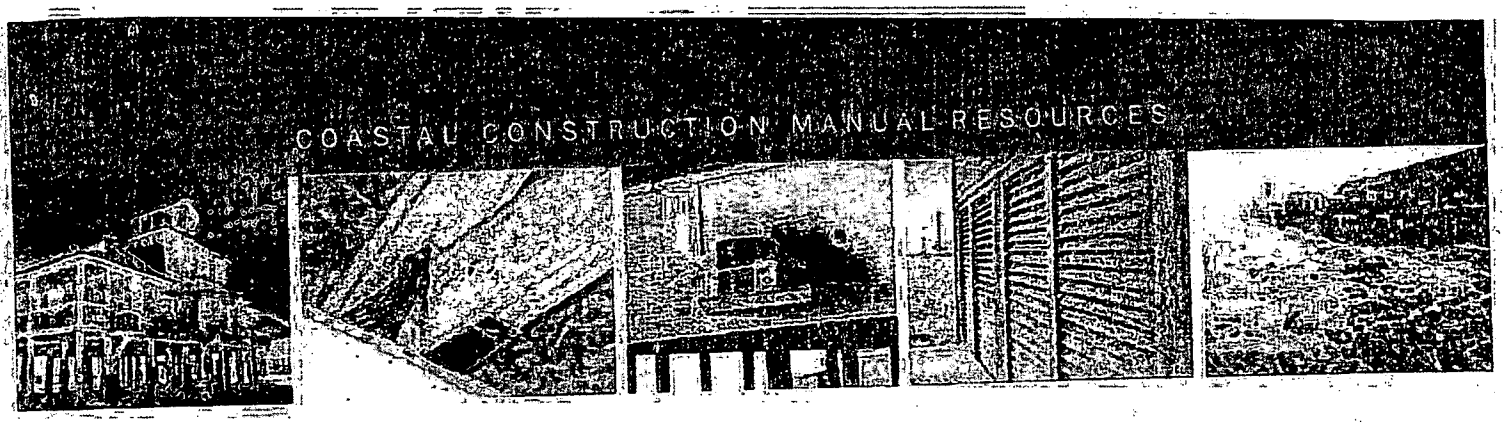
Figure 14-4. Deteriorated wood sill plate

14.4 References

FEMA (Federal Emergency Management Agency). 1996. *Corrosion Protection of Metal Connectors in Coastal Areas for Structures Located in Special Flood Hazard Areas.* NFIP Technical Bulletin 8-96.

Shifler, D.A. 2000. *Corrosion and Corrosion Control in Saltwater Environments.* Pennington, NJ: Electrochemical Society.

Williams, R., M. Knaebe, and W. Feist. 1996. *Finishes for Exterior Wood: Section, Application and Maintenance.* Forest Products Society.



Dune Walkover Guidance

This resource contains copies of the following two publications, which provide design criteria for beach walkover structures:

Beach/Dune Walkover Guidelines, by the Florida Bureau of Beaches and Coastal Systems, Florida Department of Environmental Protection, Revised January 2006.

Beach Dune Walkover Structures, SUSF-SG-76, by Todd L. Walton, Jr., and Thomas C. Skinner. Published by the Marine Advisory Program of the Florida Cooperative Extension Service and the Florida Sea Grant, March 1983.



Beach and Dune Walkover Guidelines

Florida Department of Environmental Protection
Division of Water Resource Management
Bureau of Beaches and Coastal Systems
3900 Commonwealth Boulevard, MStation
Tallahassee, Florida 32399-3000
(850) 488-7708

On many of Florida's beaches, sand dunes and coastal vegetation provide significant protection to upland property, upland development, and the beach dune system. The Florida Department of Environmental Protection (DEP) encourages the design of beach access, including beach and dune walkovers, to protect the dune topography and dune vegetation from pedestrian traffic and allow for the natural recovery of damaged or eroded dunes.

PERMIT REQUIREMENTS

A permit from DEP is required for construction of walkovers on most sandy beaches fronting on the open waters of the Atlantic Ocean or Gulf of Mexico. In areas where a Coastal Construction Control Line (CCCL) has been established pursuant to provisions of Section 161.053, Florida Statutes (F.S.), a permit is required for all excavation, construction, or other activities with the potential to cause beach erosion or damage coastal vegetation. On sandy shorelines where a CCCL line has not been established, a permit is required for construction activities within 50 feet of the mean high water line (see Section 161.052, F.S.).

Permits for walkovers contain standard conditions that require construction to be conducted in a manner that minimizes short-term disturbance to the dune system and existing vegetation. Replacing vegetation destroyed during construction with similar plants suitable for beach and dune stabilization is required. Only limited excavation for the placement of support posts is authorized, and construction of walkovers may not occur during the marine turtle-nesting season, which extends May 1 through October 31 (except for Brevard through Dade counties, which extends March 1 through October 31).

GENERAL SITING GUIDELINES

The walkover shall be designed and sited to protect dune features, to minimize disturbance of native vegetation, to not restrict lateral beach access and to minimize the amount of construction material that may become debris during a storm. Elevated walkovers are not required for all beach accesses, such as in sparsely vegetated, low profile dune areas where on-grade sand or shell paths are suitable for controlling foot traffic. Walkovers should generally be constructed perpendicular to the shoreline and extend at least to the seaward toe of the frontal dune or the existing line of vegetation but not farther than 10 feet seaward of the vegetation. The optimum siting of the walkover structure can be determined by contacting a CCCL field inspector.

GENERAL DESIGN GUIDELINES

Walkovers are designed to be minor, expendable structures that pose a minimal interference with coastal processes and generate minimal amounts of debris. Walkovers constructed across native beach and dune vegetation should be post-supported and elevated a sufficient distance above the existing or proposed vegetation to allow for sand build-up and clearance above the vegetation. Whenever possible, stairways and ramps leading from the dune bluff or crest down to the beach should be designed with posts that completely span the seaward slope of the dune. The structure should be designed to minimize the quantity of material used in construction, such as avoiding the use of vertical wood pickets, and reducing the length and width of construction on the beach.

Single family walkovers should not exceed 4 feet in overall width and the support posts shall not be greater than 4-inch wide posts. Multi-family walkovers shall not exceed 6 feet in overall width and the support posts shall not be greater than 6-inch wide posts. Round posts are preferred to square posts. Support posts shall not be

encased in concrete nor installed into dune slopes that are steeper than approximately 30 degrees. Support posts should have a minimum 5 feet of soil penetration. Applicants should consult with the Bureau prior to requesting a permit for a walkover that contains switchbacks, long ramps or other features required to comply with the Americans with Disabilities Act Accessibility Guidelines.

WALKOVER ELEVATION GUIDELINES

Site conditions affecting walkover heights vary as the structure traverses the beach/dune system. The ground cover changes from the uplands, commonly covered with woody scrub or coastal strand vegetation (saw palmetto/sea grape/scrub oaks), over a dune bluff or one or several dune crest(s), covered with either coastal strand or coastal grassland (sea oats/bitter panicum/marsh hay), down the slope to the dry sand beach, either uncovered bare escarpment or partially covered with beach/dune vegetation (railroad vine/sea rocket/sea oats). The type of structure and height from the dune bluff or crest down to the beach also must be considered in setting the walkover elevation. Increased elevation of the structure requires a longer run to the beach and additional construction material within this high energy area. This creates additional storm generated debris, sea turtle nesting habitat impacts, sand losses due to storm wave scour, and interferes with people's ability to walk along the beach.

Walkover Elevations in Uplands. The upland environment of coastal scrub/coastal strand habitat is characterized by more stable soil conditions with less blowing sands and infrequent storm overwash events. The stable conditions allow for the development of a mature woody vegetation and saw palmetto dominated plant community. In addition to thick above ground stem and leaf vegetation between 5 and 15 feet in height, this plant community has an extensive below ground woody root mat. Walkovers in these upland habitats need be elevated only a sufficient distance above the ground to avoid disturbance of the soil and root systems or cutting of low tree and palmetto trunks. An elevation of the stringers from 6" to 2'-0" above existing grade should be sufficient. Walkover elevations crossing coastal wetlands within upland areas may require increased elevations. Elevation of the walkover above the leaf canopy is in most cases impractical in coastal scrub or coastal strand habitats.

Walkover Elevations over Bluffs. The low stringer elevation recommended for uplands can be carried to an eroded bluff line. This will reduce the length of a ramp or walkover down to the beach. Again the objective the walkover elevation is to reduce damage to coastal scrub soils and root systems.

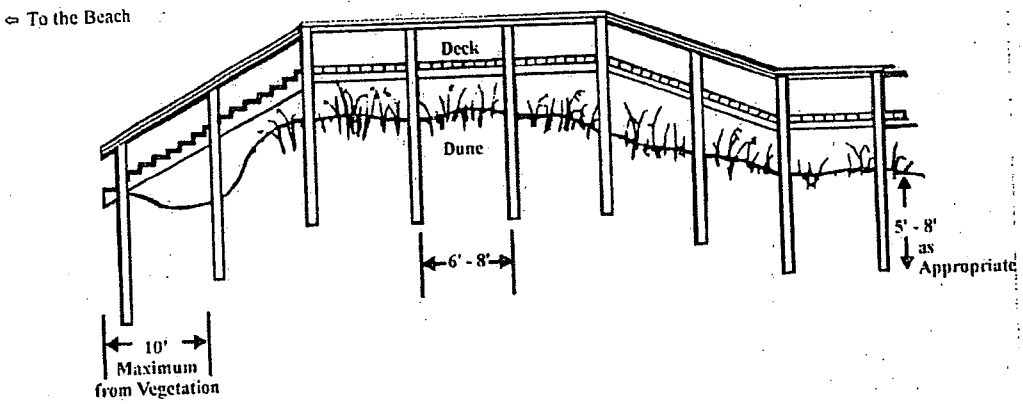
Walkover Elevations over Dune Crests. Dune environments are characterized by mobile sands subject to storm effects (which lower grade elevations) and wind effects (which can raise elevation as sand is trapped). Dunes are dominated by coastal grassland plants adapted to the dynamic environment. These include sea oats, bitter panicum, and little bluestem. Walkovers sited within active dune systems are required to be elevated sufficiently to allow for sand movement and growth of vegetation. Walkover designs published in "Beach/Dune Walkover Structures" referenced below specify a 3'-10" minimum clearance from existing grade to the bottom of the stringers of an up to 6-foot wide (overall dimension) multi-family or public beach access structures, and a 3'-0" minimum clearance to the top of the deck for an up to 4-foot wide single family structures.

Walkover Elevations on Seaward Dune or Bluff Slopes. The elevation of the walkover at the dune crest and the distance of the seaward terminus from the water's edge determine the height of the steps or ramps crossing the seaward slope. The design objective is to get the structure down to the beach in as short a shore-normal (perpendicular to the shoreline) distance as possible while reducing the shore-parallel coverage of the slope. Department guidelines require that the seaward terminus of the structure be no farther seaward than 10 feet from the line of permanent beach dune vegetation or the toe of the frontal dune. Reducing the seaward encroachment and shore-parallel width decreases the potential for storms interacting with the structure, occupation of sea turtle nesting habitat by the structure, and interference with lateral public beach access. Walkovers designed for the Americans with Disabilities Act often increase the length of walkover ramps on the beach. This requires the need for a site specific review for environmental impacts. The burial of the ramp or

step terminus a minimum amount (0.5 to 1.0 feet)-foot below grade may allow for use of the walkover after some lowering of the beach elevation from minor storms. However, placement of this terminus below the depth of a post storm beach profile is discouraged as this portion of the walkover will most likely have been damaged by larger storms and to have interfered with coastal processes.

On Grade Walkovers. Elevated walkovers are not necessary in all site conditions and use situations. Where dune development is minimal, beach dune vegetation sparse or use infrequent, on-grade footpaths may be preferred. The Department discourages solid concrete walks and footpath surfaces such as stepping stones that create debris or missiles. Other surfaces such as geotextile fabrics, cabled wood planks, or shell require a case by case review. No permanent path surfaces are allowed seaward of the dune or within sea turtle nesting habitat.

TYPICAL WALKOVER PROFILE



References

Beach/Dune Walkover Guidelines, the Florida Bureau of Beaches and Coastal Systems. Florida Department of Environmental Protection, Revised January 1998.

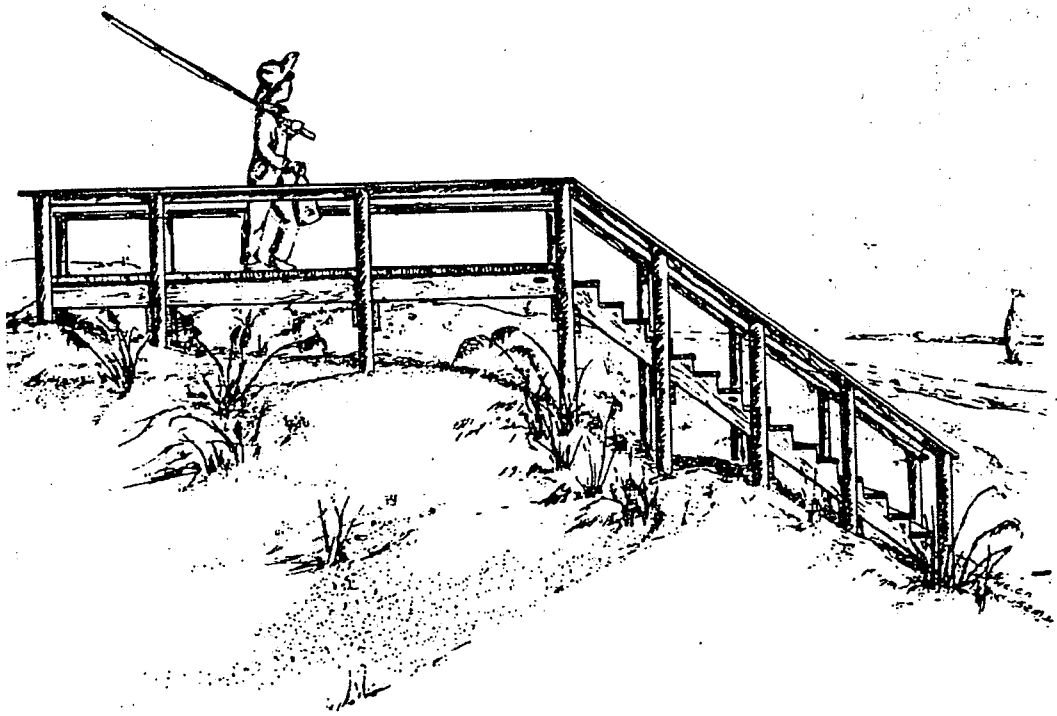
Beach/Dune Walkover Structures, SUSF-SG-76 by Todd L. Walton, Jr., and Thomas C. Skinner. Published by the Marine Advisory Program of the Florida Cooperative Extension Service and the Florida Sea Grant, March, 1983.

SEA GRANT

MAP-18

Beach Dune Walkover Structures

Todd L. Walton, Jr. and Thomas C. Skinner



Florida Cooperative Extension
Marine Advisory Bulletin

MARCH 1983*

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BEACH DUNE WALKOVER STRUCTURES

by

Todd L. Walton, Jr.[1] and Thomas C. Skinner[2]

INTRODUCTION

The idea behind this publication originally came from the Bureau of Beaches and Shores, Department of Natural Resources, State of Florida. It was recognized that numerous dune systems within our state were undergoing destruction due to the loss of vegetation caused by unrestricted access to the beach over the dune systems. As the vegetation was lost, the wind became capable of eroding the dune and caused a progressive deterioration of the entire dune system.

In areas of high human traffic, a beach walkover structure is needed to save this vegetation. Two structure designs are presented in this publication. Figures 1 through 7 give details of a structure for use in areas of heavy foot traffic. A good example of such use might be for a condominium or a community public access ramp. The depths of pilings account for both depth necessary for structure stability and added depth to account for possible dune deflation losses.

Figures 8 and 9 give details of a smaller structure more suitable for the typical coastal land owner where only light foot traffic is expected. The depth of pilings in sand is correspondingly less which should minimize interference with the dune system in construction of the walkway. It should be noted that any construction seaward of the State Coastal Construction

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[1] Coastal Engineering Advisory Specialist, Marine Advisory Program, with the Coastal and Oceanographic Engineering Laboratory, University of Florida.

[2] Extension Agricultural Engineer, Florida Cooperative Extension Service, IFAS University of Florida.

Setback Line (Reference 1) must be permitted by the Bureau of Beaches and Shores, Department of Natural Resources.

The designs are basic enough such that various alternatives can be added to the designs without altering the structures to a great degree. One such alteration would be a transverse extension of the deck section with benches for people to sit on overlooking the beach area. The addition of properly spaced skid resistant materials to the decking of the ramp section of the large walkover structure would make the deck and the deck extension accessible to handicapped people in wheelchairs. Additional features which could also be added are limited only by the planner's imagination.

The authors would like to thank both Mr. Gill Hill and Mr. William Sensabaugh of the Bureau of Beaches and Shores, Department of Natural Resources, for the ideas and suggestions used in these plans. The authors hope that this publication will lead to the building of more walkover structures in areas where dune systems are threatened by human traffic. The authors also hope to hear any suggestions, comments, or criticism which might be included in a future revision of this publication.

MATERIALS SPECIFICATION SHEET

(1) Wood

All wood to be pressure treated in accordance with American Wood Preservers Association Standard C-2. The preservative used should be a waterborne preservative such as Type B or C or equivalent as covered in Federal Specification TT-W-535 and AWPA Standards P5, C2, and C-14. The type wood to be used depends on the quality of the construction desired. A suitable inexpensive wood for construction would be southern pine. Higher grade and more expensive woods would be the heartwood of Bald Cypress, Redwood, or Eastern Red Cedar. Very expensive but extremely durable and decay resistant woods would be Greenheart or Basra Locus. "Rough cut" lumber can be used on all lumber in the substructure while "dressed" (i.e. surfaced) lumber should be used on the flooring and hand-rails. Further information on the specifications for buying lumber can be found in Reference 2.

(2) Hardware

All bolts and other hardware to be hot dipped galvanized.

(3) Nails

All nails to be galvanized.

GENERAL NOTES

(1) Bolts in handrails shall have nut end toward post. Countersink so that bolt does not project beyond post. Trim excess of projecting bolts after fastening.

(2) Use bolts for all connections to posts.

(3) Do not encase bottoms of pilings in concrete. This would be termed objectionable construction in obtaining a permit from the Bureau of Beaches and Shores.

(4) Some may find the pitch of the steps (8 on 10) too steep; likewise the ramp slope (20%) is too steep for handicap access (8.33% recommended). The design may be modified accordingly.

(5) Check with local building officials to make sure the design contained herein, or as modified, conforms to local codes and ordinances.

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1. Coastal Construction Setback Line by J. A. Purpura and W.M. Sensabaugh, Marine Advisory Bulletin, SUSF-SG-74-002, Florida Cooperative Extension Service, 1974. (Out-of-Print).

2. Wood Handbook: Wood as an Engineering Material, U.S.D.A., Forest Products Laboratory, 1974.

3. Timber Design and Construction Handbook, McGraw Hill Publishing Co., 1956.

4. Wood Engineering, G. Gurfinkel, Southern Forest Products Association, 1973.

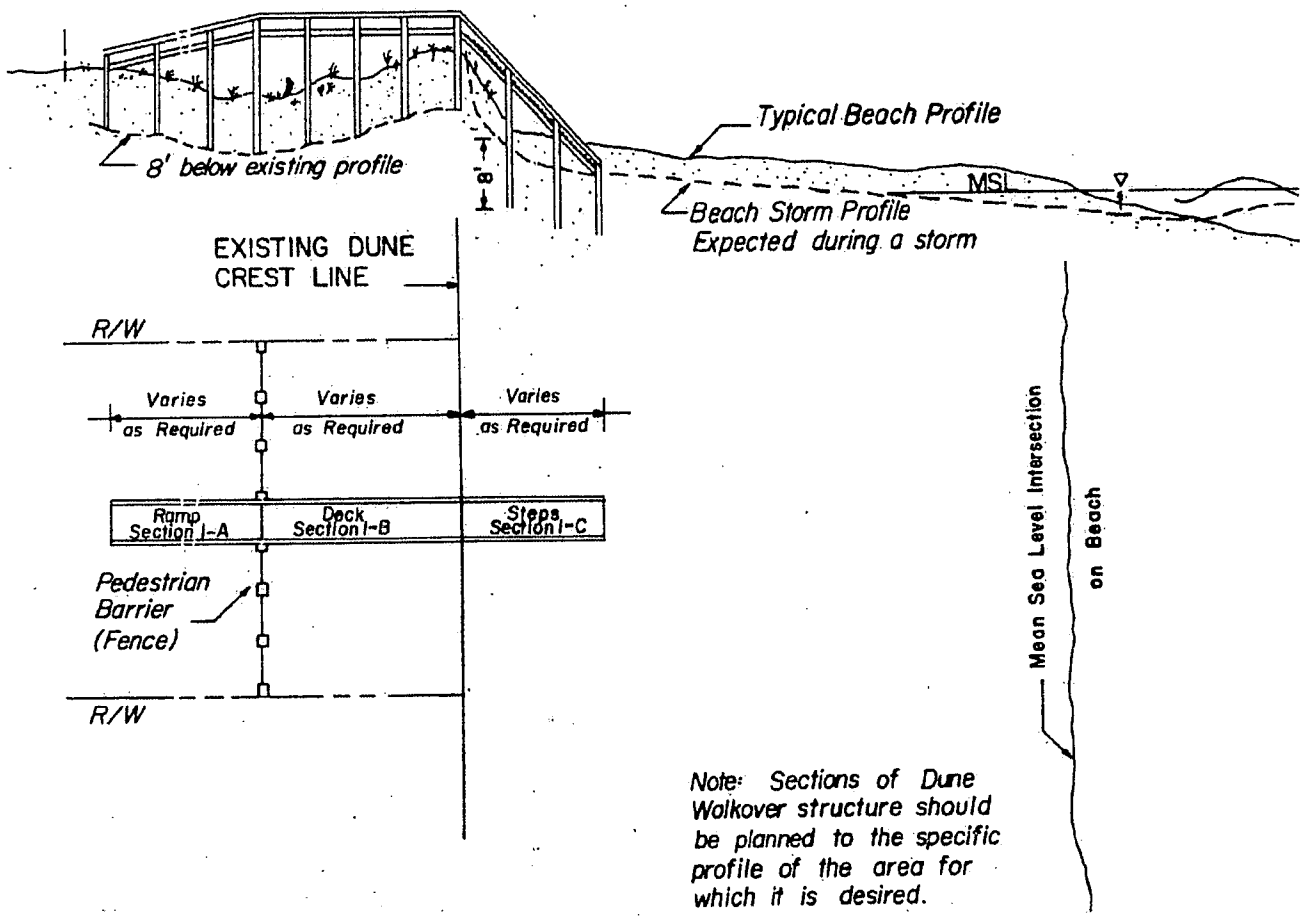


Fig. 1 TYPICAL PLAN and ELEVATION VIEW

Scale: 1" = 20'

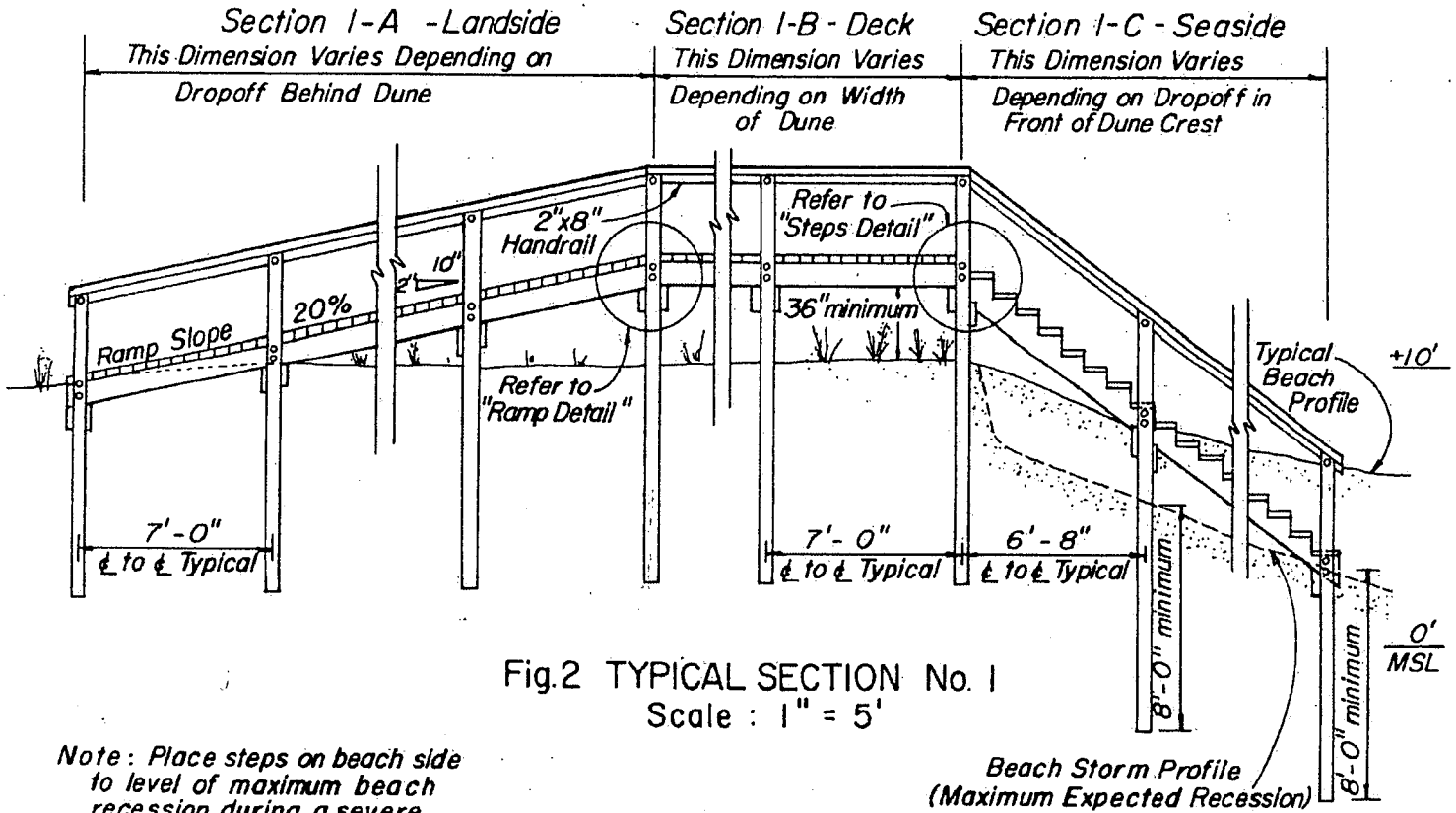


Fig.2 TYPICAL SECTION No. 1
Scale : 1" = 5'

Note : Place steps on beach side to level of maximum beach recession during a severe storm or tropical hurricane

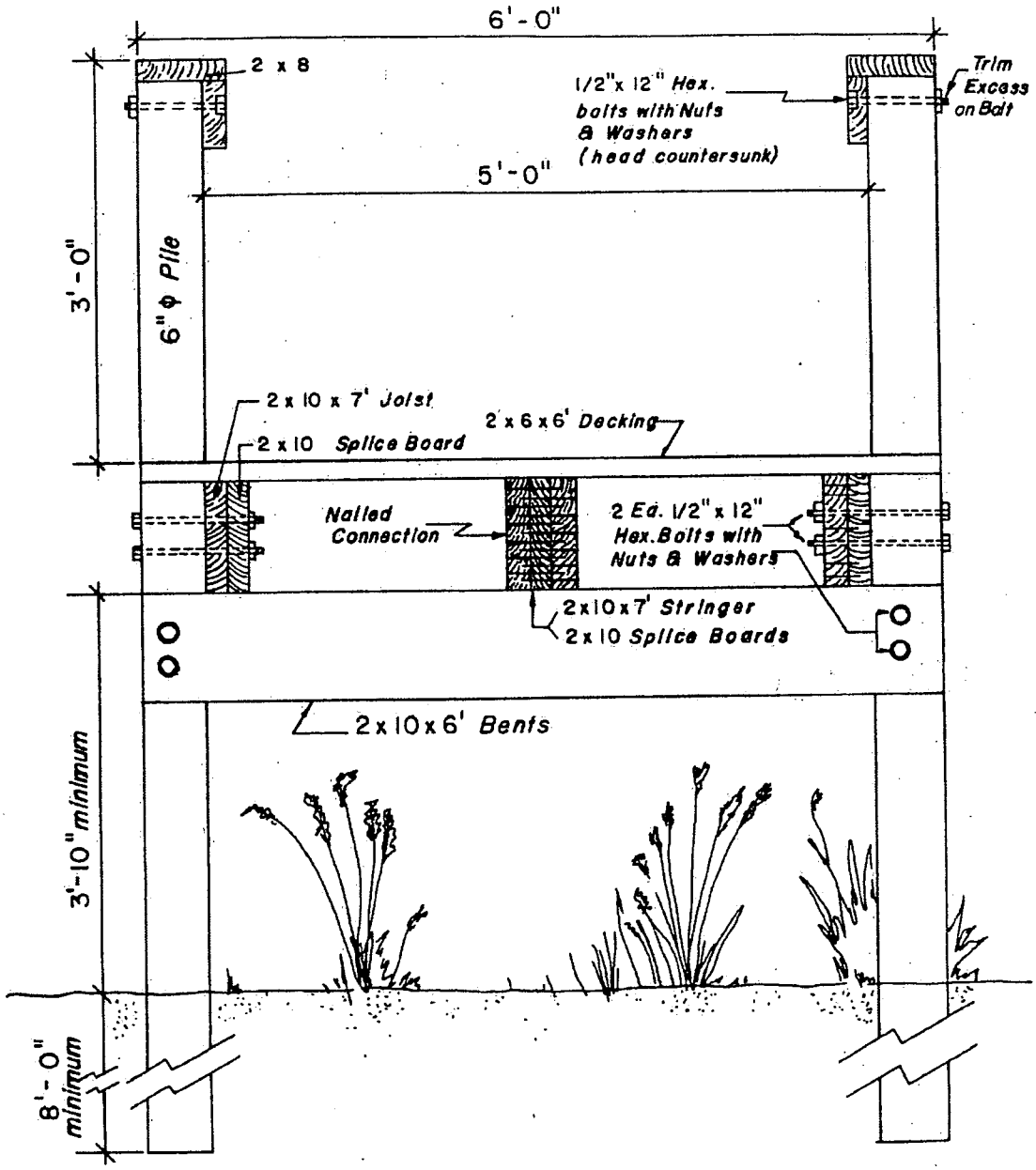


Fig. 3 TYPICAL SECTION I-B DECK
Scale: 1" = 1'-0"

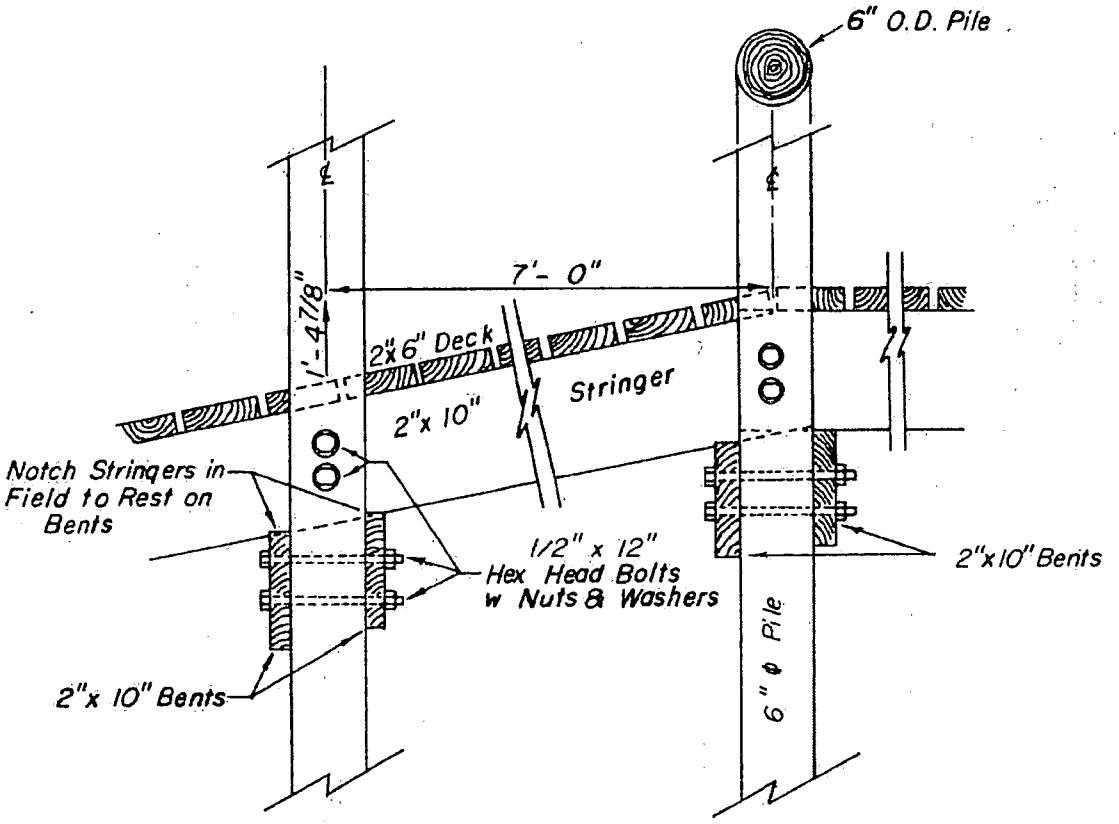


Fig. 4 TYPICAL RAMP DETAIL

Scale: 1" = 1'- 0"

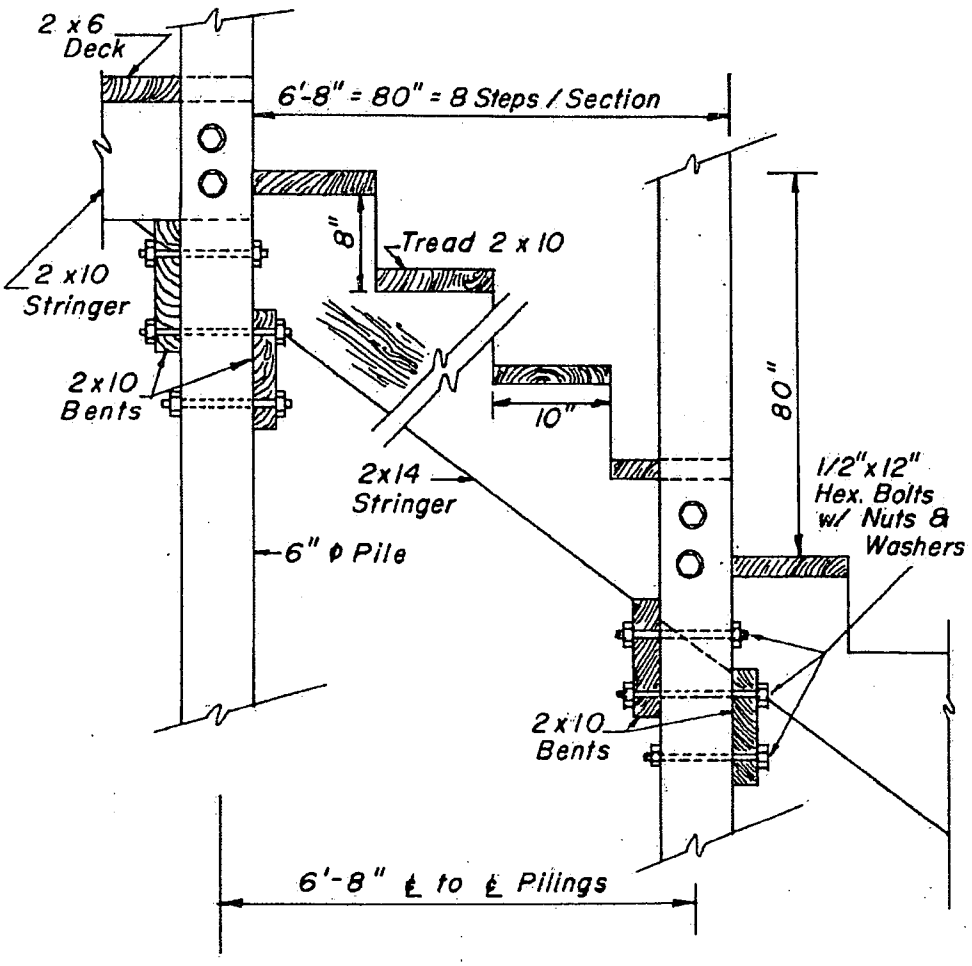
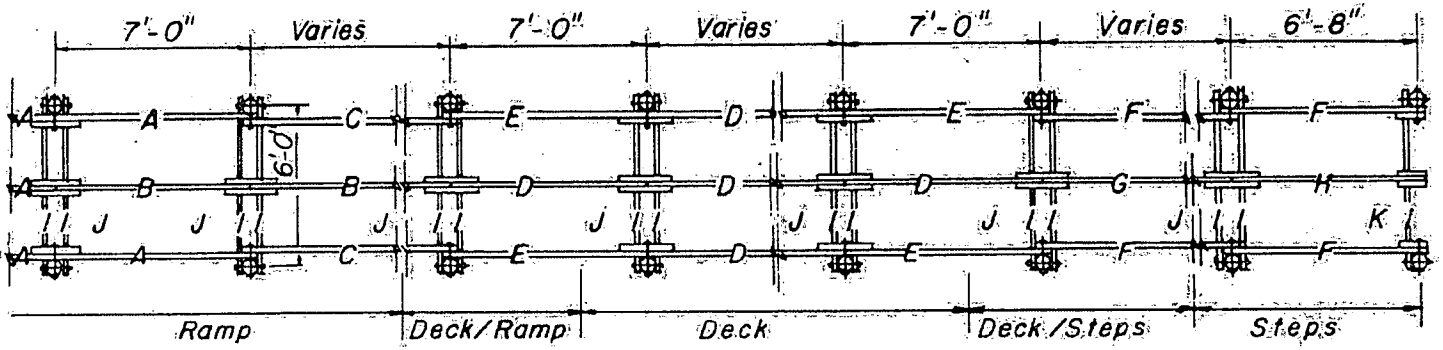


Fig. 5 TYPICAL STEPS DETAIL

Scale : 1"= 1'- 0"



Stringer Dimensions		
A	2 x 10 x 7'-9"	
B	2 x 10 x 7'-6"	
C	2 x 10 x 8'-4"	
D	2 x 10 x 7'-0"	
E	2 x 10 x 7'-3"	
F	2 x 14 x 9'-0"	notched for steps
G	2 x 14 x 8'-6"	notched for steps
H	2 x 14 x 8'-9"	notched for steps
Bent Dimension		
I	2 x 10 x 6'-6"	
Splice Dimension		
J	2 x 10 x 2'-0"	
K	2 x 10 x 1'-6"	

Note: Bill of Materials based on ramp length of 21', deck length of 28' and 2 stair sections of 6'-8" each.

Note: All splice blocks to be nailed to stringers to provide both lateral support at joints and bearing support. All pile bolted connections to be 1/2" x 12" hex bolt with nut and washers.

Bill of Materials		
Quan.	Item -- Description	
44	2 x 6 x 20'	dressed
9	2 x 8 x 20'	dressed
5	2 x 10 x 20'	dressed
19	2 x 10 x 20'	rough
3	2 x 14 x 20'	rough
20	6" ϕ Piles @ 16'	
100	1/2" x 12" hex bolt with nut and washers	

Fig. 6 TYPICAL STRINGER LAYOUT DETAIL

Scale: 1" = 5'-0"

Include as many step sections as necessary to grade from top of dune + 3 feet to base of rear dune.

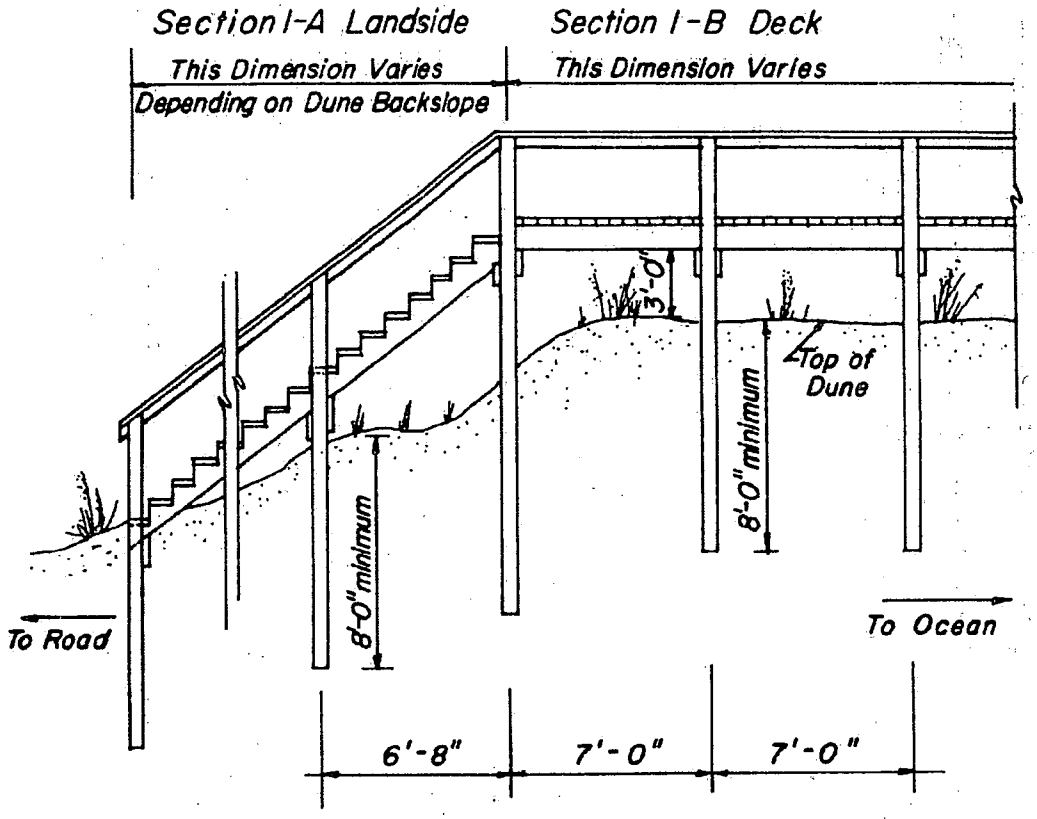


Fig.7 ALTERNATE SECTION No.1
Scale : 1" = 5'-0"
(Refer to details as per Figure 2)

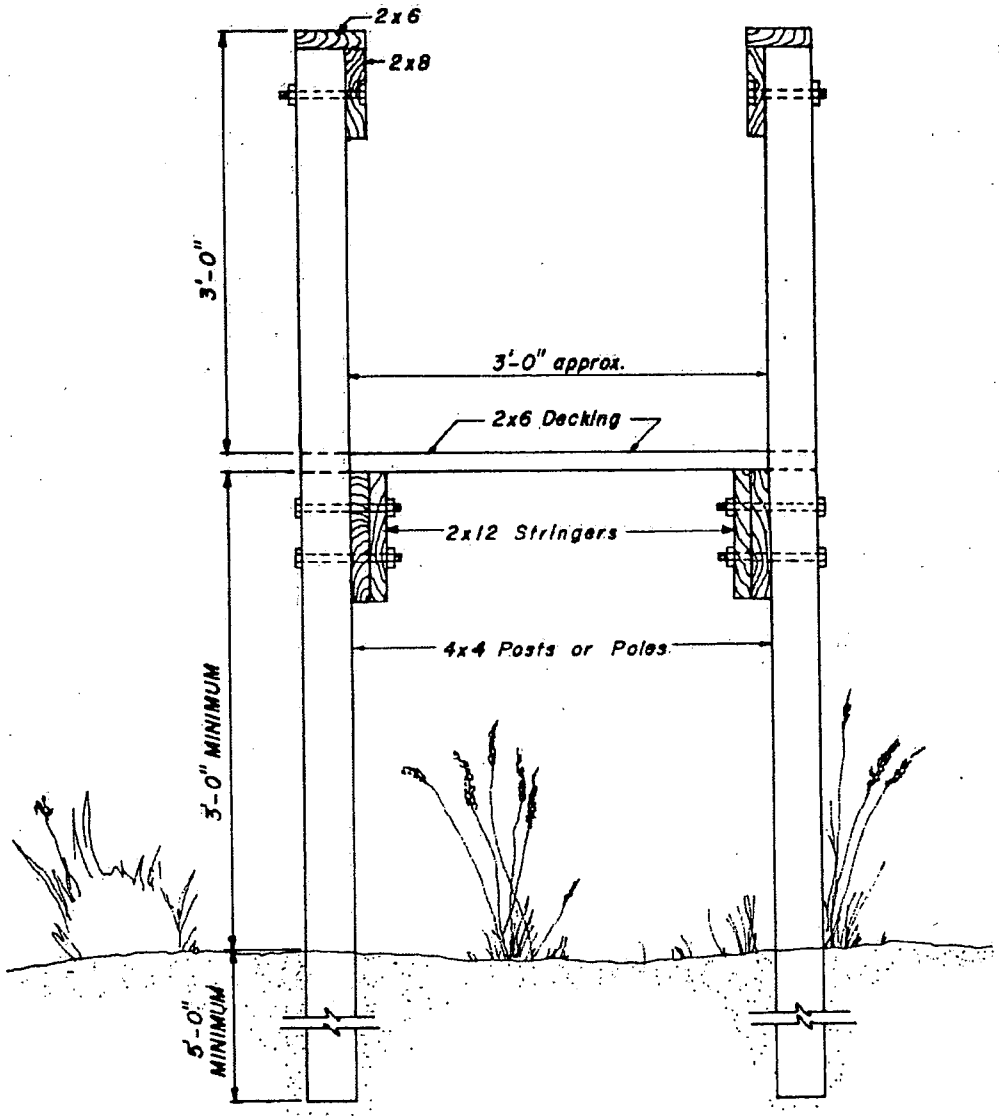
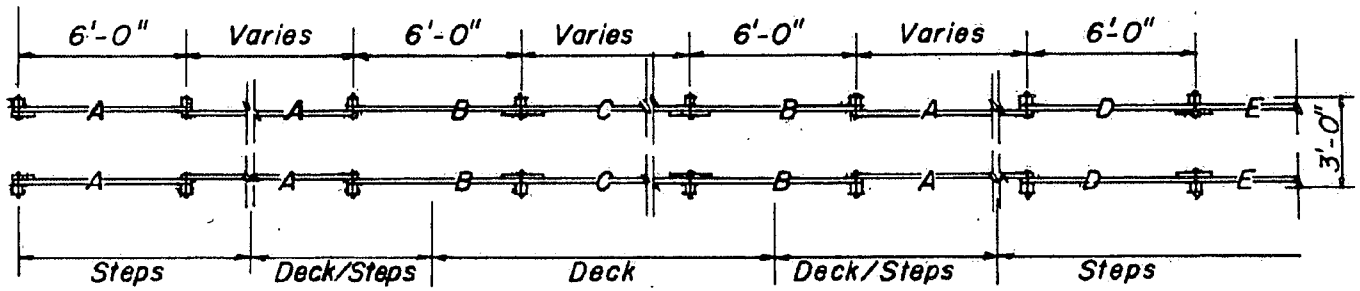


FIG. 8 TYPICAL SECTION scale: 1"=1'-0"



STRINGER DIMENSION	
A	2 x 12 x 8' notched for steps
B	2 x 12 x 7'-9"
C	2 x 12 x 6'
D	2 x 12 x 7'-8" notched for steps
E	2 x 12 x 7'-6 notched for steps
SPLICE BLOCK DIMESION	
F	2 x 12 x 1'-6"

BILL OF MATERIALS	
QUANT.	ITEM DESCRIPTION
108'	2x12 Stringers & Splice blocks
16	4"x4" Posts or Poles
66	1/2"x12" Hex bolt w/ nut and washers
36	2x6x20' dressed
28	2x8x20' dressed
4	2x10x20' dressed

Note: *All splice blocks to be nailed to stringers to provide both lateral and bearing support at joints. All pile bolted connections to be 1/2"x 12" hex bolt with nut and washers. Bill of Materials based on 24' deck and step lengths, 6' and 12'.*

FIG.9 TYPICAL STRINGER LAYOUT
scale: 1" = 5'



South Carolina Guide to Beachfront Property

Insight for Informed Decisions

PLAINTIFF'S EXHIBIT 30 12-4-17 HD
PENDAD 800-631-6989

[redacted]

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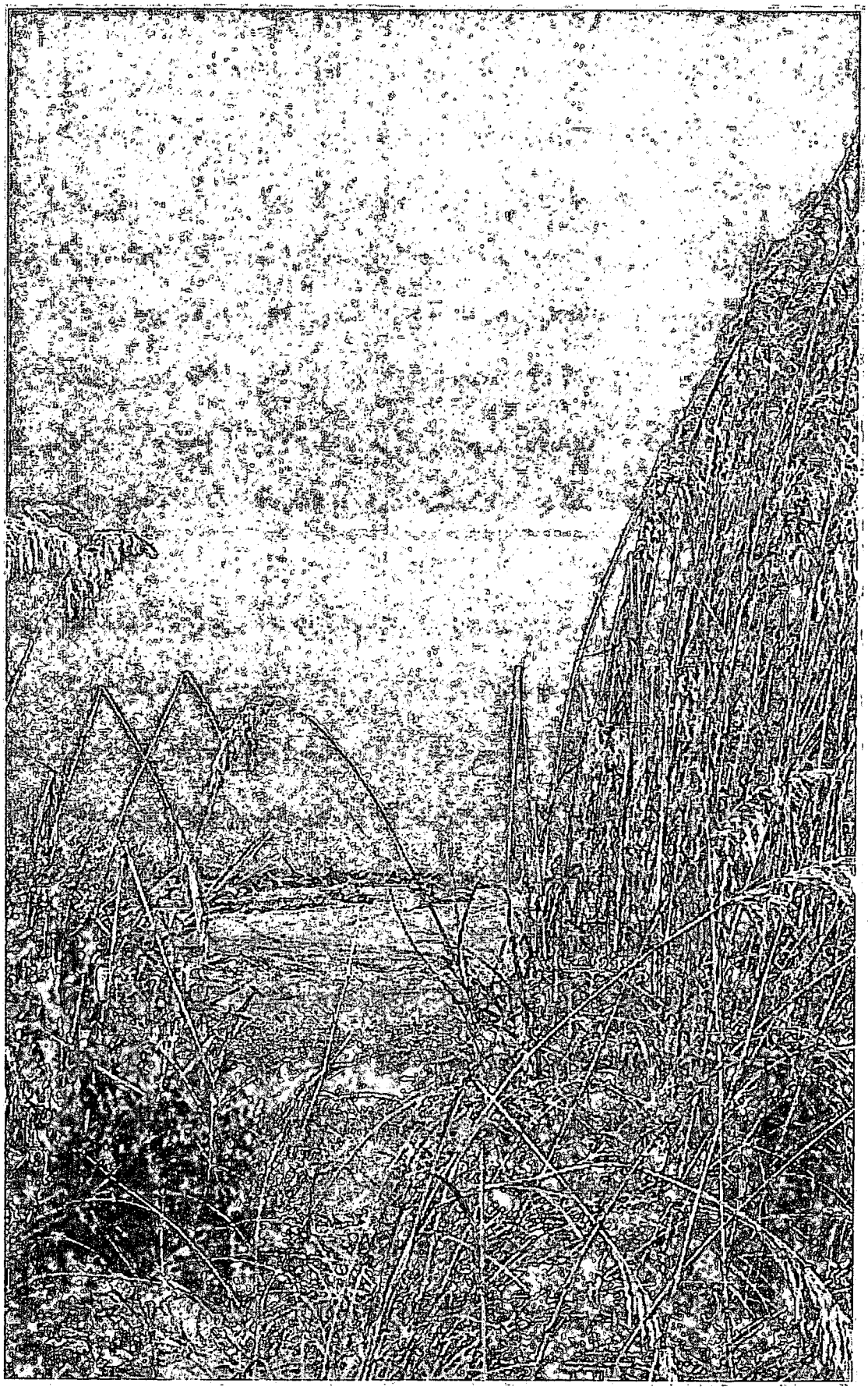
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Introduction

With nearly 200 miles of oceanfront shoreline, South Carolina is home to some of the most spectacular beaches in the world. The beautiful, dry sand beaches, rolling dunes, and wildlife attract vast numbers of tourists, new residents, and investors alike. However, before purchasing coastal property, potential buyers should consider a number of different factors.

Like any other coastal location, South Carolina oceanfront and adjacent properties may be susceptible to an array of natural hazards. These hazards may affect property value, or potentially increase ownership costs, including insurance and hazard mitigation (e.g. renourishment, building dunes, moving the structure more landward, or increasing the elevation of the structure). Federal, state, or local legislation may also affect your decision to purchase coastal property. Buyers should be informed of the specific laws governing oceanfront properties and the types of activities allowed.

This guide is designed to address questions that arise for individuals purchasing coastal property. It provides guidance on topics, such as what to consider before buying coastal property, how to renovate coastal property, and how to manage the property should it be damaged by a natural hazard. Whether considering an undeveloped lot or one with an existing structure, there are critical issues to examine.

Common Coastal Hazards

The South Carolina coastline is dynamic and constantly changing due to a common coastal hazard – beach erosion. Beach erosion can be a long-term, chronic condition caused by a variety of factors, or it may be short-term as the result of a single or series of storm events, like hurricanes, tropical storms, or nor'easters. In addition to erosion, beachfront homes may also be threatened by high wind and flooding from storm-driven waves or tides.

Long-Term Chronic Erosion

The majority of South Carolina beaches undergo long-term chronic erosion, often called "beach migration," due to coastal geological processes. Ocean currents, prevailing winds, proximity to inlets, locations of nearshore sandbars, and other natural or manmade features will affect the long-term rate of erosion along a beach. Chronic erosion can be exacerbated by gradually rising sea levels. Sea level in the Charleston area has risen nearly one foot during the last century, causing beaches to migrate landward. Long-term erosion poses a considerable risk to beachfront properties, yet it is often misunderstood. Many people associate erosion with short-term storm events and do not contemplate the effects of long-term chronic erosion.

Erosion rates are measured by analyzing historical shoreline positions and calculating annual erosion rates based on beach profile and volumetric data. Erosion rates can be localized to a specific area. In fact, it is possible for one stretch of beach to show no signs of erosion, while an adjacent stretch of beach loses a large volume of sand annually. Beaches along inlets are often the most unstable and profoundly affected. Some "migrating inlets" are constantly moving in one direction. Others may expand and contract in

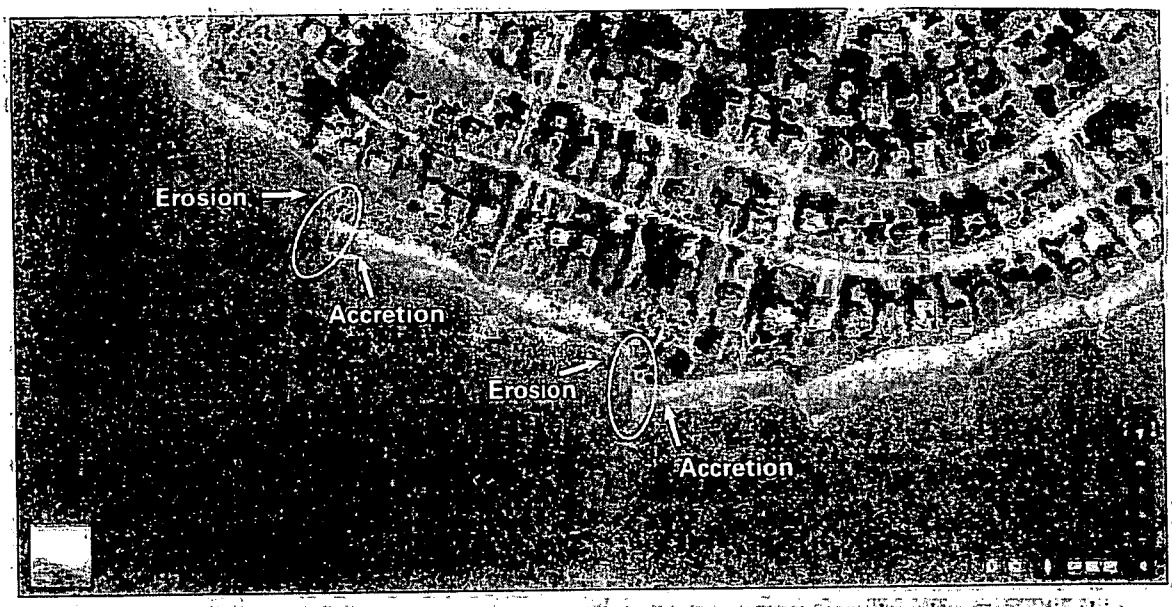


Figure 1. A groin (yellow circle) can trap sand on one side but increase erosion on the other, as seen in this example of Edisto Island (Google Map 2014).

intervals. In addition to natural causes, chronic erosion can be set in motion by human activities. For example, a groin built to stabilize a portion of the beach can trap sand on one side but increase erosion on the other (Figure 1).

Storm-Driven Erosion

South Carolina's beaches are also vulnerable to rapid, storm-driven erosion. Hurricanes, or large storms like nor'easters, generate strong waves and currents that can intensify erosion along the shoreline. These events, particularly when coupled with storm surge, can cause sudden and widespread changes to the shoreline and put property in imminent danger (Figure 2). Even if a storm does not make landfall, beaches may still be affected.

Coastal storms also cause seasonal fluctuations of the shoreline. Generally, beaches erode more in the stormy fall and winter months than in the calm summer months. Of course, when a beach is hit directly by a hurricane, beachfront erosion can be extensive and severe. Inlets are also affected by seasonal storms and can change configuration rapidly as large volumes of water and sand flow through them. In severe storms, it is even possible for new inlets to form and existing inlets to close.

Flooding

Flooding is the most common disaster in the United States, and can occur as a result of storm surge, heavy rain events, and/or high tides. Coastal flooding is a common occurrence, as most coastal properties are in low-lying areas and are subject to inundation from saltwater. Not only can flooding threaten property, but it can also prevent access to certain areas, reduce mobility, and prevent safe evacuations due to damaged or impassible roadways.

Long Term Erosion Rates: Long term erosion rates are determined by analyzing historical shoreline positions and calculating annual erosion rates based on beach survey data. Each year, DHEC monitors over 400 survey monuments on state beaches to conduct analysis, in conjunction with professional coastal engineers or shoreline researchers from leading academic institutions.

AVOID PURCHASING PROPERTY PRONE TO HAZARDS

Purchasers of coastal property should always research coastal hazards, seeking information on pertinent laws and regulations from local governments, the South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management (DHEC-OCRM), and a licensed real estate professional. Uninformed decisions can lead to unexpected costs to the property owner. Potential buyers take on risk from damage of a highly erosional beach, which may result in property damage and may require further actions to mitigate the hazard. Similarly, potential buyers take on risk by purchasing property in a flood zone, which may result in flood damage and expensive insurance costs if the home is not



Figure 2. Erosion at Folly Beach caused by Tropical Storm Irene in 2011 and Alberto in 2012, both storms passed more than 100 miles offshore. Photo courtesy of DHEC.

built to current building codes. The following section provides information to buyers considering beachfront property prone to hazards, as well as guidance for how to protect their investment.

Know State Laws

The South Carolina Beachfront Management Act (SC Code Ann. §48-39-250 et seq.) and associated regulations establish the state's jurisdictional authority within the beachfront critical areas. Within these areas, DHEC regulates new construction, repair, and reconstruction of buildings in addition to the maintenance of erosion control structures. However, new erosion control devices are strictly prohibited within the setback area. The purpose of these laws and regulations is to protect the quality of the coastal environment while affording reasonable use and development of property.

State Beachfront Jurisdiction

The state's beachfront jurisdictional lines are calculated by analyzing current and historical shoreline positions and long-term erosion rates. DHEC is mandated by the South Carolina Beachfront Management Act to review the position of the beachfront baseline and setback line every eight to ten years.

Within standard erosion zones, the baseline is established at the location of the crest of the primary oceanfront sand dune. On armored beaches and areas without a primary sand dune, DHEC uses scientific methods to determine where the natural dune would be if natural or man-made occurrences had not interfered with nature's dune building process. For inlet areas that are not stabilized by jetties, terminal groins or other structures, the baseline is determined as the most landward point of erosion at anytime during the past 40 years. Within inlet areas that are stabilized, the baseline is determined by the location of the primary oceanfront sand dune.

The setback line is established landward of the baseline at a distance of 40 times the beach's annual erosion rate. The erosion rate is calculated using the best available historical shoreline position and scientific monitoring data. For example, if the erosion rate is one foot per year, the resulting setback line will be positioned 40 feet landward of the baseline. Even if a beach is gaining sand through accretion or is otherwise not experiencing erosion, the setback line is always located a minimum distance of 20 feet landward of the baseline (Figure 3).

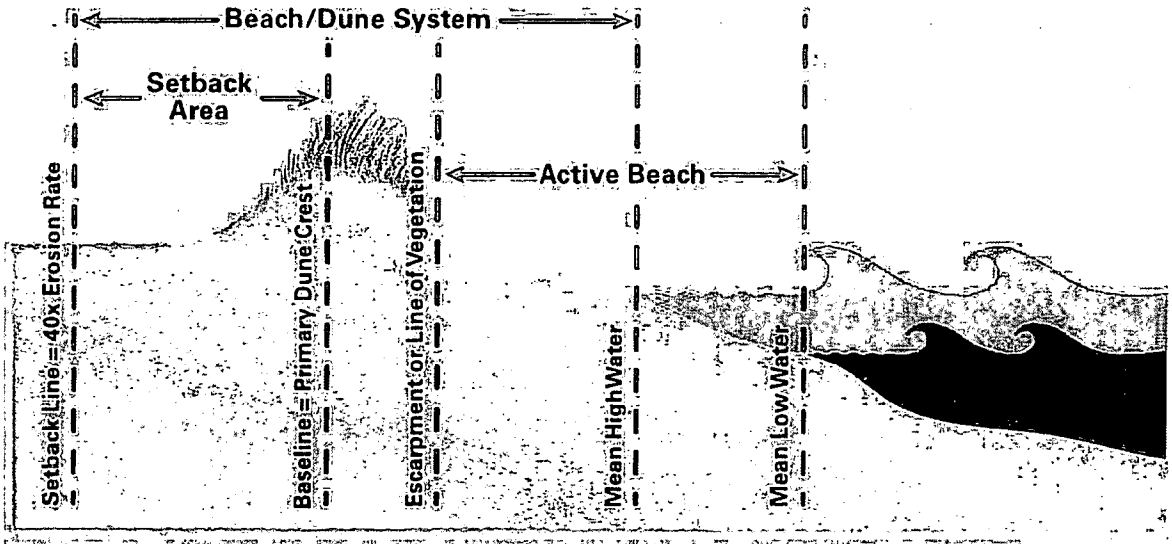


Figure 3. Cross-section of beach profile, including the State's jurisdictional baseline and setback line in a standard zone.

Determine if Erosion is an Issue

Erosion rates vary from one municipality to another, but may also vary significantly along a specific beach. Due to localized differences, it is imperative to gather information regarding specific erosion rates for the area in which the property is located. The adopted long-term erosion rates for a specific property can be found through the DHEC Beachfront Jurisdiction web application (http://gis.dhec.sc.gov/shoreline/). The website application is a convenient way to locate a parcel, identify the state's beachfront jurisdictional baselines and setback lines, and obtain an adopted erosion rate for the area of interest (Figure 4).



Figure 4. South Carolina Beachfront Jurisdiction web application. Available at http://gis.dhec.sc.gov/shoreline/

Ask a Licensed Real Estate Professional

South Carolina law requires that a contract of sale or transfer of real property contain a disclosure statement if a property is affected by the state's beachfront jurisdictional authorities. Licensed real estate professionals have a fiduciary responsibility to disclose material facts, like the adopted erosion rates of beachfront properties (§48-39-330). Although agents might not always know the erosion rates for particular oceanfront properties, they should provide assistance in obtaining this information.

Research Resilience to Large Storms

South Carolina has been fortunate to only experience minor hurricane impacts since Hurricane Hugo in 1989. Hugo made landfall slightly north of Charleston, at Sullivan's Island, as a Category 4 hurricane, with sustained winds of 135-140 mph. It was the costliest storm in South Carolina history, causing over $7 billion in damages (National Weather Service; Figure 5).

Even if a hurricane does not make a direct landfall, beachfront communities are frequently affected by erosion caused from storms passing offshore. For example, in 2011, Hurricane Irene passed about 120 miles offshore, causing extreme erosion in some locations. Consequently, Folly Beach County Park was forced to close for two years and did not reopen until the beach could be renourished.

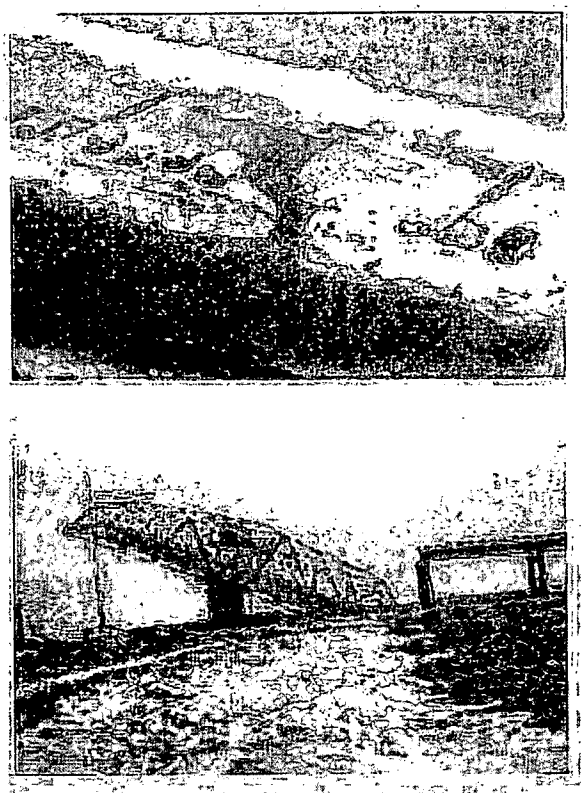


Figure 5: During Hurricane Hugo in 1989, (top) a new inlet formed on Pawleys Island, and (bottom) the Ben Sawyer Bridge collapsed near Charleston, South Carolina. Photos courtesy of NOAA.

Seek Local Knowledge

Ask local residents about their knowledge of the stability of the beach, renourishment projects that have been completed or planned, flooding from storms, etc. Their experiences and long-term knowledge can provide valuable insight into the area.

Moreover, archived news articles from the local papers can provide information about how the area fared after particular storm events.

Investigate Insurance Options & Requirements

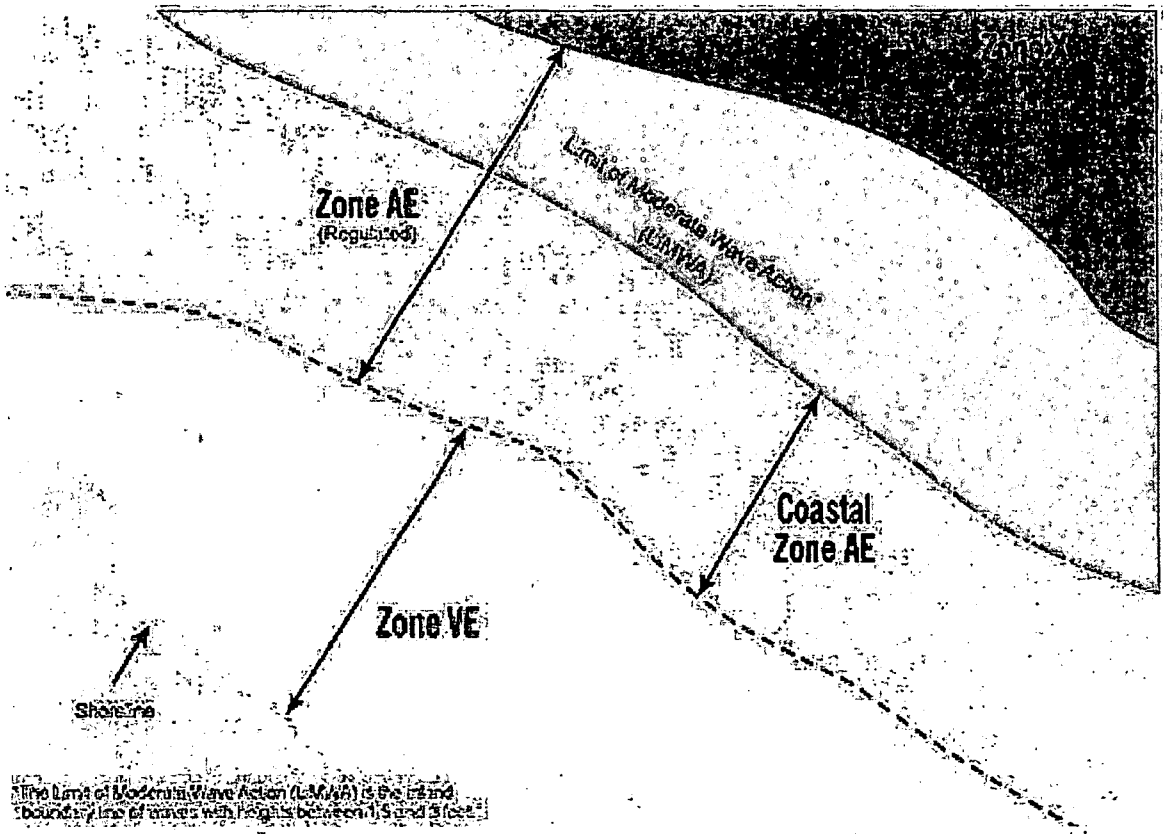
Standard homeowner's insurance does not cover flood damage. Whether building a home or buying property, be sure to know the flood risk of the area. Depending on the risk associated with the property, it is wise, and may be mandatory, to purchase flood insurance. To better understand flood risks and potentially reduce flood insurance rates, locate flood insurance maps of the area of interest and obtain an elevation certificate to determine the required elevation of the structure.

Flood Insurance Rate Maps

FEMA produces flood insurance rate maps (FIRMs) that identify coastal flood risk areas using the latest data and technology. FIRMs delineate flood risk zones, Special Flood Hazard Areas (SFHAs; Figure 6), and identify Coastal Barrier Resources Act (COBRA) zones. SFHAs include Zone VE and Zone AE and have at least a 1% chance of flooding in any given year and a one-in-four chance of flooding during a typical 30-year mortgage period. These areas take into account the risk from storm surge and wind-driven waves and often require the owner to have flood insurance. Zone X is considered a low risk area for flooding. Purchasing flood insurance for Zone X is usually not required, but may provide property owners with additional protection.

As a way to minimize loss of human life and limit damage to natural resources associate within undeveloped coastal areas, Congress enacted the Coastal Barrier Resources Act. The Act identifies particular coastal barrier resources system (CBRS) units and Otherwise Protected Areas (OPA), collectively called COBRA zones. Development within COBRA zones is permitted; however, federal financial assistance is not available in COBRA zones.

Information on the flood risk and COBRA zones for a specific property can be found on the FEMA website (www.fema.gov/national-flood-insurance-program-flood-hazard-mapping). If the property falls into a SFHA, an insurance agent should be contacted to discuss purchasing a flood insurance policy.



The Limit of Moderate Wave Action (LiMWA) is the inland boundary of areas with heights between 1.5 and 3 feet.

Zone VE—a high-risk area where storms drive waves landward at heights of 3 feet or more.

Coastal Zone AE—a high-risk area subject to wave heights of 1.5 to 3 feet. For flood insurance purposes, this zone is treated as Zone AE; however, communities are encouraged to regulate construction to include Zone VE standards as these waves can still cause significant damage to coastal structures.

Zone AE—a high-risk area subject to waves less than 1.5 feet in height. This will be separated from the Coastal AE zone by the Limit of Moderate Wave Action (LiMWA). A LiMWA may not always be present, in which case, only Zone AE is shown.

Zone X—areas of moderate risk (shown as a shaded zone X) or low risk (zone X). While the risk is reduced, nearly 25% of all flood claims come from these zones.

Figure 6: Flood Risk Zones, courtesy of FEMA FloodSmart.gov

Elevation Certificate

The elevation of a structure compared to the estimated Base Flood Elevation (BFE), or the elevation to which floodwater is anticipated to rise, can have a major impact on the costs of flood insurance. The BFE of an area can be found in the FIRM. If a current elevation certificate is not available for the property, a state-licensed surveyor will need to complete one. To learn more about elevation certificates, access FEMA's *Homeowner's Guide to Elevation Certificates Fact Sheet* (www.fema.gov/media-library-data/20130726-1914-25045-8243/floodsmart_factsheet_homeowners.pdf).

Changes to the National Flood Insurance Program

Under the National Flood Insurance Program (NFIP), many flood insurance policy holders have been paying federally-subsidized rates for flood insurance that do not reflect the true risk associated with property and homes in flood-prone areas. In July 2012, Congress passed the Biggert-Waters Flood Insurance Reform Act to make the NFIP more financially stable by phasing in rate increases until the policy holder reaches the actuarial, or non-subsidized rate. However, in response to rapidly increasing flood insurance costs, the Homeowner Flood Insurance Affordability Act was subsequently signed into law in March 2014 to repeal and modify some provisions of the Biggert-Waters Flood Insurance Reform Act. Despite these amendments, many provisions of the Biggert-Waters Flood Insurance Reform Act continue to be implemented, affecting insurance options for property owners. When purchasing a home, it is important to understand not only what the insurance rate is at the time of purchase, but what the full actuarial rate will be in the future. Contact a reputable insurance agency and the local planning department for more information.



Developing on Coastal Property

BUILDING ON AN UNDEVELOPED BEACHFRONT LOT

The South Carolina Beachfront Management Act establishes a jurisdictional area along South Carolina's coast where certain activities are regulated or prohibited. Regulations outline specific standards for the construction of a new home, the repair or replacement of an existing home, routine maintenance of an erosion control device, and the construction or replacement of a swimming pool within the state's beachfront jurisdictional area.

If any portion of a property falls seaward of the jurisdictional setback line, be sure to contact DHEC Ocean and Coastal Resource Management before beginning construction. Failure to do so may result in fines and/or the removal of the structure at the property owner's expense.

Construction Seaward of the Setback Line

All construction seaward of the setback line requires a written authorization or permit from DHEC-OCRM before work begins. Prior to the commencement of activities, property owners must certify to DHEC that any construction meets specific conditions and provide construction plans for review. Within the setback area, new habitable structures must be built as far landward as possible and are limited to a maximum of 5,000 square feet of heated space. New swimming pools may be constructed if located behind a functioning erosion control device. No construction may alter the beach's primary sand dune or active beach zone. Construction of new erosion control devices is strictly prohibited within the setback area. To notify DHEC of your development plans, the Beachfront Notification Form (www.scdhec.gov/library/D-3896.pdf) should be submitted prior to construction activities.

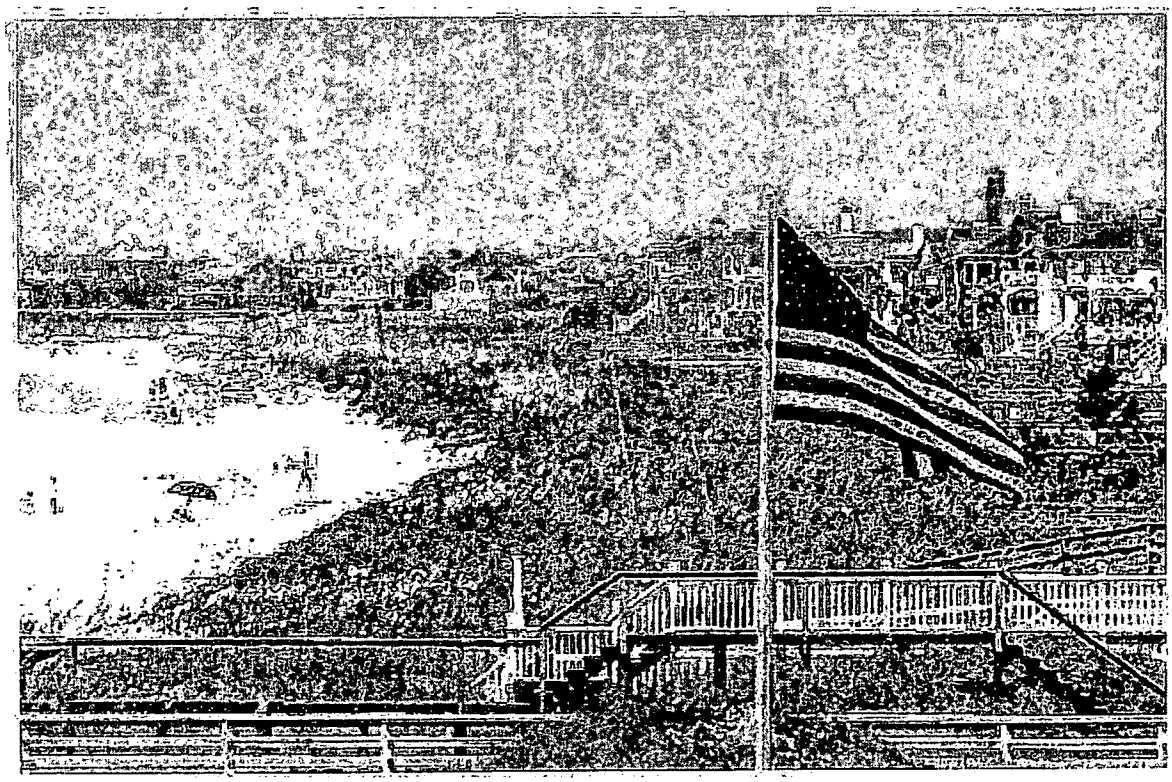
Construction Seaward of the Baseline

Special Permits must be obtained to build seaward of the baseline. Among other requirements, the structure (usually a house) must be built as far landward as possible and have no impact on the primary sand dune or active beach area. Other nonhabitable structures built seaward of the baseline require permits, with the exception of wooden dune walkovers less than six feet wide. Permits are required for wooden decks (144 square feet maximum allowed), public fishing piers, golf courses, and normal landscaping. If the beach erodes and the permitted structure becomes situated on the active beach, the property owner, at his or her own expense, must remove the structure if so ordered by DHEC-OCRM. Again, construction of new erosion control devices within state beachfront jurisdiction is strictly prohibited.

To obtain Special Permit application and Beachfront Notification Form information, please visit our website at www.scdhec.gov/Environment/PermitCentral/ApplicationForms/#OCRM.

Coastal Construction Features.

Several features can prevent or substantially reduce the likelihood of damage from severe storms and



erosion. Pilings can be used to raise the first floor above expected flood elevations and storm-driven waves. In many areas, embedding the tip of pilings deeper than ten feet below sea level can help to reinforce a building to withstand the impacts of severe erosion. Any first floor walls constructed between pilings should be designed to break away when hit by waves to prevent damage to the elevated portion of the building.

Elevating a building may protect it from storm surge and flooding, but it also increases its exposure to storm winds. The key to reducing wind damage is in the quality of the design and construction of the building. If building a new home adjacent to the beach, consider employing the services of a professional engineer to help ensure an adequate structural design.

Remember, however, that no home is disaster-proof. There are inherent and unavoidable dangers associated with building homes along the beach. Because of the substantial costs of coastal property, a professional engineering analysis could be a wise investment. The Federal Emergency Management Agency (FEMA) also provides a comprehensive approach to planning, siting, designing, constructing, and maintaining coastal property in the Coastal Construction Manual (FEMA P-55 - 8/2011) (www.fema.gov/media-library-data/20130726-1510-20490-2899/fema55_voli_combined.pdf).

Sand dunes are natural features that provide significant protection during the most severe storms. It is important to protect and enhance dunes by keeping vehicles and people off them, planting additional dune grasses, and installing sand fences.

Waste Management

When building new construction, the placement of the septic system takes priority over location of other structures (including the house) and improvements. The septic system must be set back a minimum of 50 feet from mean high water. Proper maintenance of septic tanks is essential, especially along the immediate beachfront where spills or leaks can have significant impacts on water quality and the environment. Additional information on proper waste management can be obtained by contacting DHEC's Bureau of Environmental Health or visiting this website at www.scdhec.gov/HomeAndEnvironment/YourHomeEnvironmentalandSafetyConcerns/SepticTanks/.

UPGRADING OR ADDING TO BEACHFRONT HOMES

Replacement, renovations, or additions to habitable structures located entirely or partially in the setback area are allowed, subject to the criteria established in the South Carolina Beachfront Management Act and associated regulations. Laws require that:

- the final structure must not exceed 5,000 square feet of heated space;
- new additions must not extend any further seaward then the existing structure;
- the linear footage of a replaced structure, parallel to the coast, must not be increased.

If structural additions are entirely landward of the setback line, notice to DHEC-OCRM is not required prior to construction. Contact the local floodplain administrator and building permit official for local floodplain management regulations and code requirements. It is important to note that if the cost of modifying a structure exceeds 50% of the value of the structure, the entire structure must be brought up to current code requirements.

Protecting & Repairing Coastal Property

Beachfront property is vulnerable to erosion, flooding, and high winds. When developing a property, being proactive by using coastal construction features can help reduce potential damages. However, once a property is developed, protecting it from harsh beachfront conditions can be challenging. The following options may help protect hazard-prone beachfront properties.

Dunes and Dune Walkovers

Beachfront property owners can mimic and support nature by creating sand dunes. Vegetated sand dunes, through direct planting or use of sand fencing, provide some of the best protection against high tides and minor storms. You can learn how to create or preserve sand dunes by reading DHEC-OCRM's guide, How to Build a Dune (www.scdhec.gov/HomeAndEnvironment/Docs/dunes_howto.pdf).

Preserving established sand dunes is also important. Walking on dunes can permanently damage or destroy them. Unnecessary wear and tear of dunes can be prevented by building dune walkovers. A dune walkover may be constructed without a permit from DHEC-OCRM if it meets the following criteria (§48 39 290):

- constructed of wood
- no wider than 6 feet
- follows the existing dune contours with a 2 ft. vertical clearance
- does not displace sand
- constructed with as little environmental damage as possible

Relocation

If space allows, a structure may be moved landward on the same lot; otherwise, it can be relocated to new property. Regardless of where the building is moved, it must meet any existing setback requirements.

Safe Home Program

South Carolina has a program in place to help property owners mitigate for wind damage associated with storms. The South Carolina Safe Home Program (http://doi.sc.gov/605/SC-Safe-Home/) is funded through the state wind pool and provides grants to property owners that allow retrofitting, or improvements during construction of a home. Some options for funding include storm resistant exterior doors (including garage doors), roof ties and roof water barriers, bracing gable ends, and storm shutters.

Sandbags, Sand Scraping, and Minor Renourishment

Sandbags, sand scraping, and minor renourishment can provide temporary protection to structures that are imminently threatened, but are only allowed pursuant to the issuance of Emergency Orders by DHEC or authorized municipal government officials acting to protect public health and safety (§48 39 130(D)(1)). A structure is determined to be in imminent danger when the erosion comes within ten feet.

Sandbags

Current regulations require sandbags to be no larger than five gallons (or 0.66 cubic feet), unless otherwise approved by DHEC-OCRM. Sandbags may not be placed any farther seaward than necessary to protect the structure and must be stacked at a 45 degree angle. Most importantly, sandbags may only be filled with clean sand that can be returned back to the beach when the bags are removed. The property owner is responsible for the day-to-day maintenance of the sandbags, as well as removal (R.30-15(H)(1)).

Sand Scraping

Property owners may also protect their homes by bulldozing sand, or sand scraping, to create temporary dunes. Sand may only be scraped from the intertidal beach and only between extended property lines of the structure receiving the sand. The depth of scraping may not exceed one foot below existing beach level. Sand may be placed against an eroded escarpment or to replace an eroded dune, but may not be placed in front of a functional erosion control structure (R.30-15(H)(2)).

Minor Renourishment

Minor beach renourishment can protect a structure in imminent danger and potentially slow erosion. When renourishing, property owners must use sand that originates from an upland source and is approved by DHEC-OCRM as being beach compatible. Sand must be placed between the extended property lines of the affected property, and may be stabilized with sand fencing and beach vegetation pursuant to permitting requirements (R.30-15(H)(3)).

Erosion Control Structures

Hard erosion control structures represent the greatest threat to the preservation of the beach. On an eroding beach, seawalls and rock revetments actually accelerate erosion by reflecting wave energy and scouring sand away from the active beach. South Carolina applies a strict regulatory position where these structures are concerned; no new erosion control structures may be constructed seaward of the setback line.

Although new erosion control devices cannot be constructed, existing functional devices may be maintained and repaired in certain circumstances. Functional erosion control structures may not be enlarged, strengthened or rebuilt, but may be maintained in their present condition. Notably, if destroyed more than 50%, the entire structure must be removed at the owner's expense (§48-39-290).

RECOVERY AFTER A STORM

Repairing and Rebuilding

Following a storm event, habitable structures within the state's jurisdiction may be repaired or rebuilt in accordance with the following criteria:

- the square footage of the replaced structure seaward of the setback line cannot exceed the total square footage of the original seaward structure
- the linear feet parallel to the coast must not exceed the original linear footprint
- where possible, the replaced structure must be moved landward of the setback line, or if not possible, must be moved as far landward as practical, considering zoning and parking regulations
- the structure must meet locally defined ordinances required for flood damage prevention
- the entire structure must be

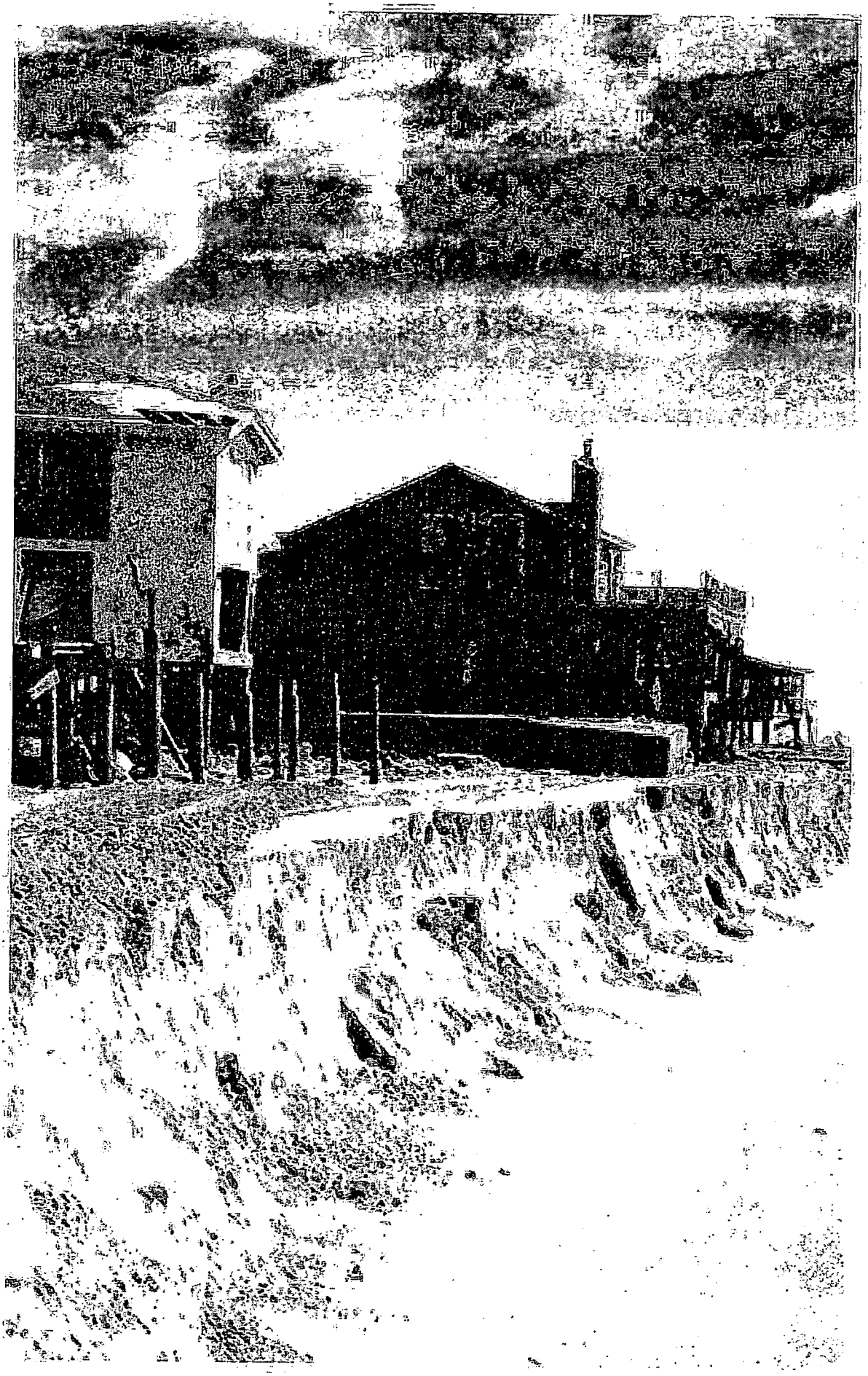
brought up to code if the cost of repairs/replacement exceeds 50% of the structure's value

Destroyed Beyond Repair

Following a major storm event, structure(s) located along the shoreline may be declared "Destroyed Beyond Repair" (DBR). For habitable structures and pools, destroyed beyond repair means more than 66 2/3% of the replacement value of the habitable structure or pool has been destroyed (R.30-14(D)(3)(a)). A structure that is destroyed beyond repair due to man-made causes can be rebuilt provided the new structure is no larger than the original structure it replaces, and is constructed as far landward as possible. The new structure must not be farther seaward than the original structure (R.30-13(E)(6)).

For seawalls, bulkheads, and revetments, damage must be judged on the percentage of the structure remaining intact, above grade, at the time of the damage assessment. If more than 50% of the erosion control structure or device has been destroyed, it must not be repaired or replaced (R.30-14(D)(3)(c)). For additional information regarding the evaluation of damage and requirements for rebuilding, see the Coastal Division Regulations 30-14(D).

In summary, this guide is designed to provide general, yet important information regarding the purchase and ownership of beachfront property in South Carolina. However, it does not address all situations that may impact a particular property. It is important to obtain all pertinent information from federal, state, and local authorities.



Additional Information & Contacts

DHEC Office of Ocean and Coastal Resource Management
www.scdhec.gov/HomeAndEnvironment/Water/CoastalManagement/

Charleston
1362 McMillan Ave., Suite 400
Charleston, SC 29405
(843) 953-0200

Myrtle Beach
927 Shine Ave.
Myrtle Beach, SC 29577
(843) 238-4528

Beaufort
104 Parker Drive
Beaufort, SC 29906
(843) 846-9810

Federal Emergency Management Agency (FEMA)
www.fema.gov
(202) 646-4600

National Flood Insurance Program (NFIP)
www.floodalert.fema.gov
1-800-638-6620

SC Department of Natural Resources Flood Mitigation Program
www.dnr.sc.gov/water/flood/index.html
(803) 734-9120

SC Sea Grant Consortium
www.scseagrant.org
(843) 953-2078

SC Department of Insurance, Consumer Services Division
www.doi.sc.gov
(803) 737-6180

SC Wind and Hail Underwriting Association
www.scwind.com
(803) 779-8373

SC Safe Home
www.doi.sc.gov/605/SC-Safe-Home/
(803)737-6087

SC Real Estate Commission
www.llr.state.sc.us/POL/REC/
(803) 896-4400

US Army Corps of Engineers/ Charleston District, Public Affairs Office
www.sac.usace.army.mil
(843) 329-8123

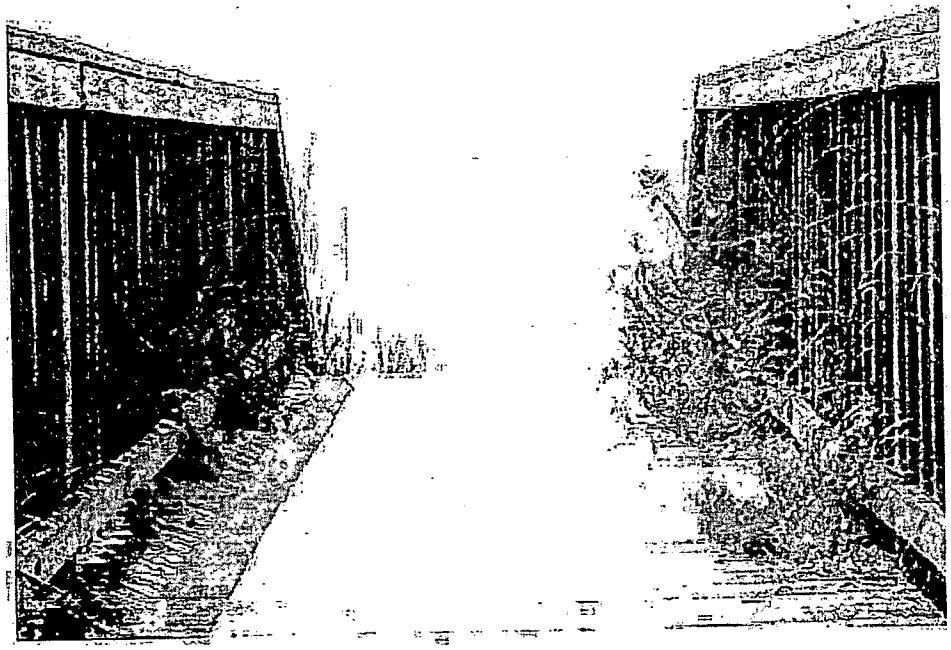
US Geological Survey – South Carolina Earthquake Information
www.earthquake.usgs.gov/earthquakes/states/index.php?regionID=40
1-888-ASK-USGS

The information in this publication is intended to be a helpful guide for purchasing coastal real estate. Since every property is unique and local codes may vary, be sure to consult your real estate professional before making a decision. Also, if you have questions about particular aspects of a property, be sure to contact the appropriate state and federal agencies.

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Contributing Organizations

ACE Basin National Estuarine Research
National Oceanic and Atmospheric Administration
South Carolina Department of Health and Environmental Control
South Carolina Department of Natural Resources
S.C. Sea Grant Consortium



D H E C

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

www.scdhec.gov

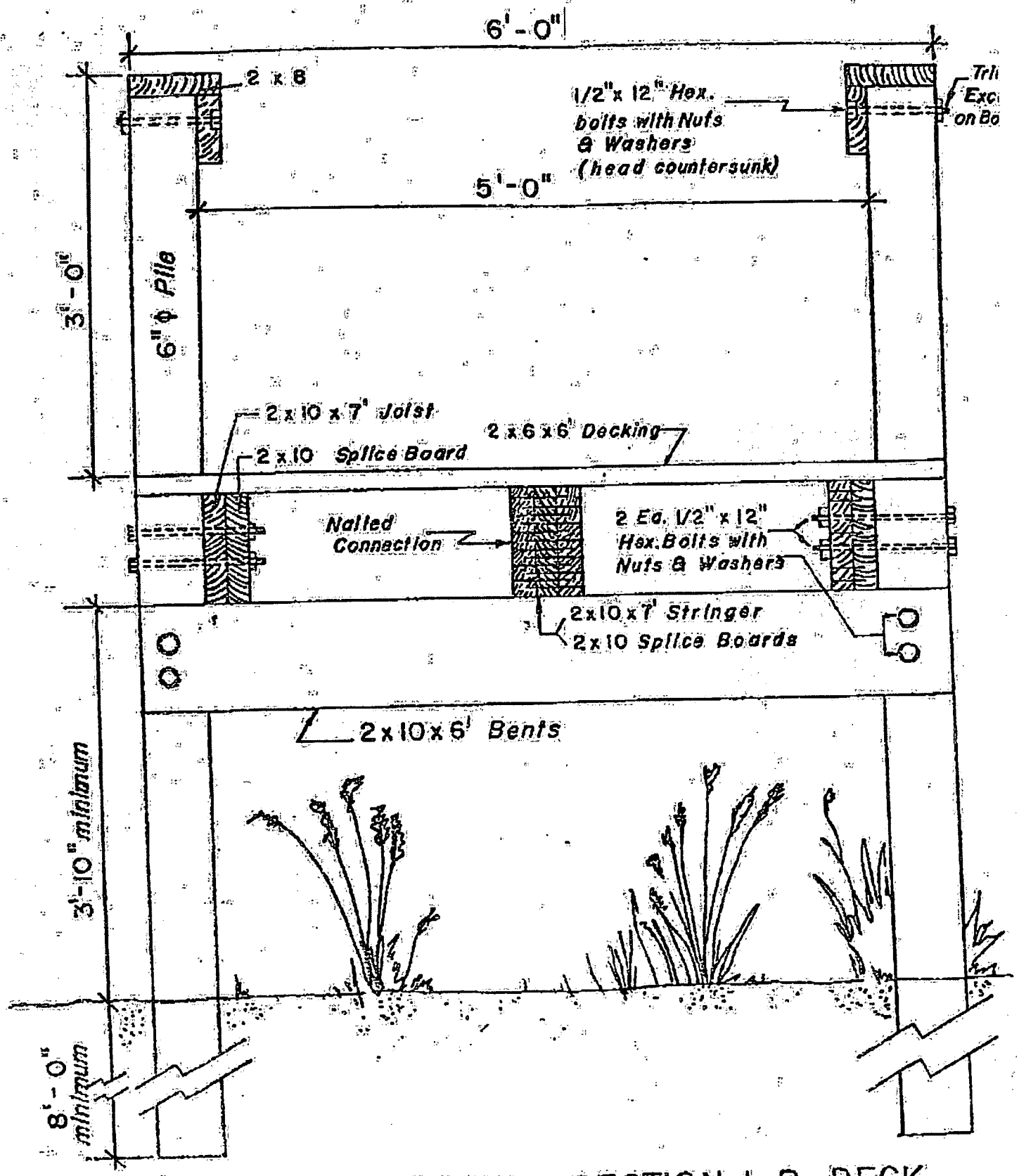


Fig.3 TYPICAL SECTION I-B DECK
Scale: 1" = 1'-0"

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PENGAD 800-631-6989

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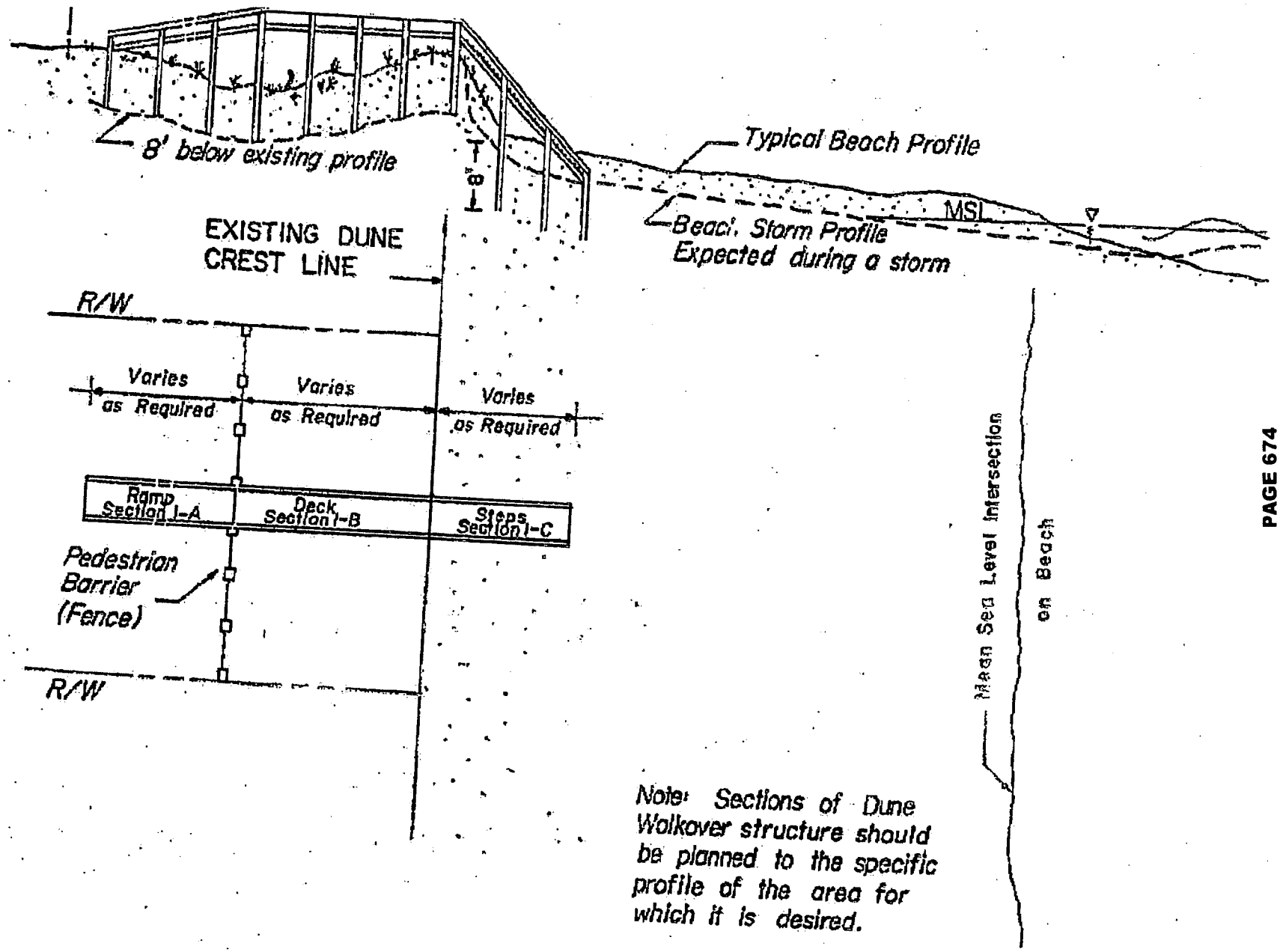
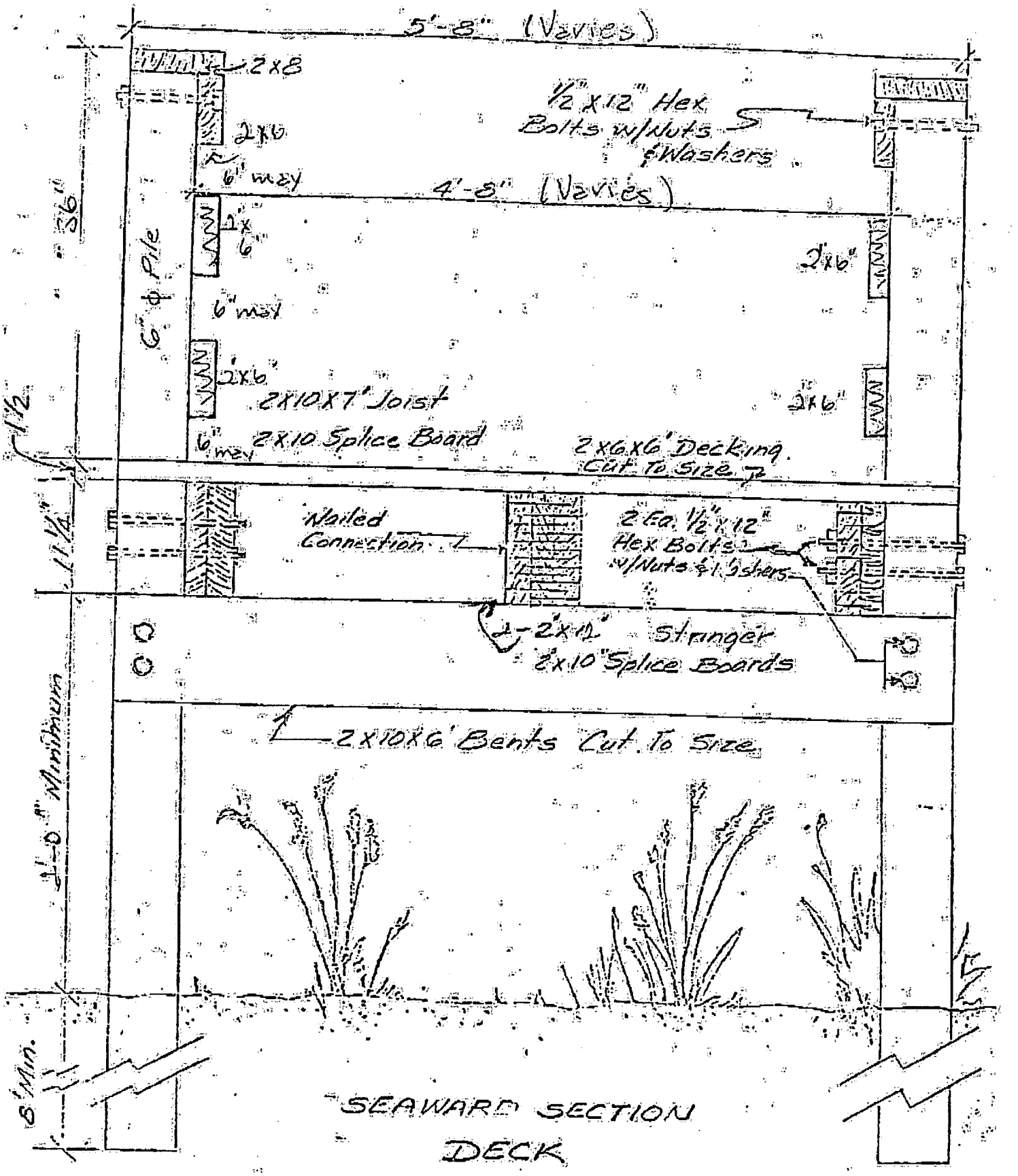


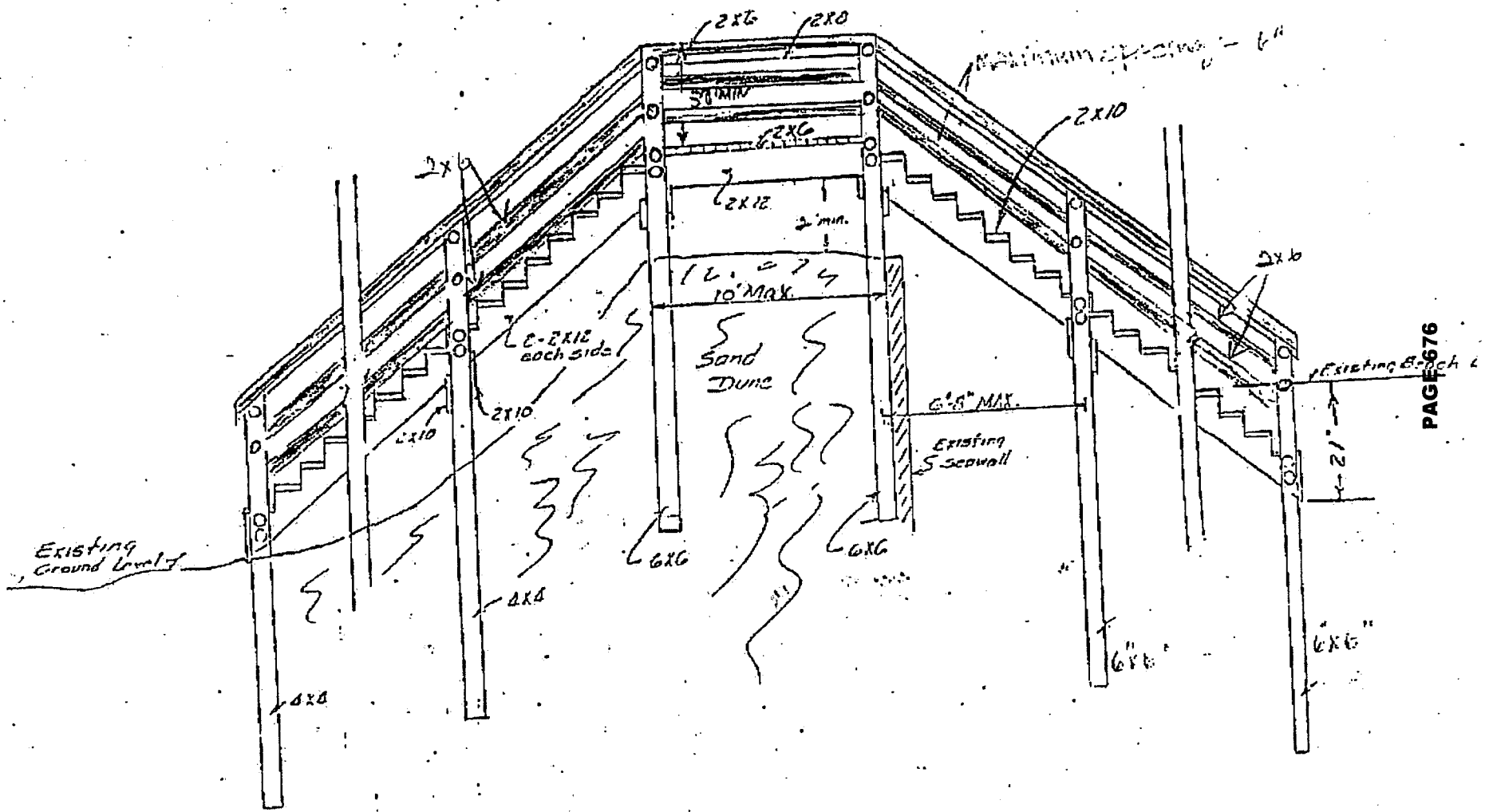
Fig. 1 TYPICAL PLAN and ELEVATION VIEW



SEAWARD SECTION

DECK

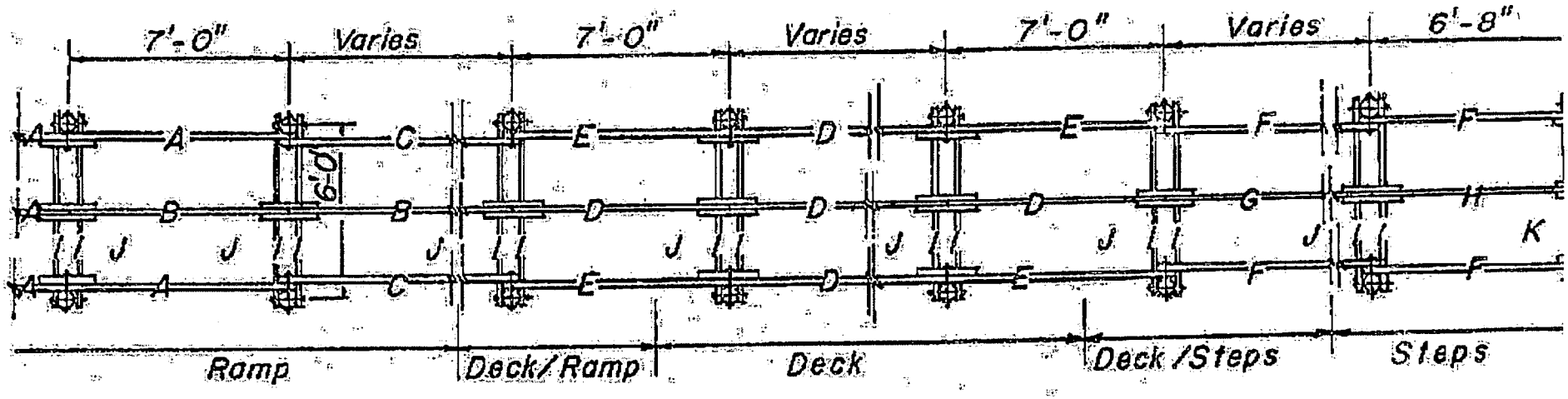
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SIDE VIEW
STEPS TO BEACH

By: Bob Alford, [illegible]
March 7, 1933

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Stringer Dimensions		
A	2 x 10 x 7'-9"	
B	2 x 10 x 7'-6"	
C	2 x 10 x 8'-4"	
D	2 x 10 x 7'-0"	
E	2 x 10 x 7'-3"	
F	2 x 14 x 9'-0"	notched for steps
G	2 x 14 x 8'-6"	notched for steps
H	2 x 14 x 8'-9"	notched for steps
Bent Dimension		
I	2 x 10 x 6'-6"	
Splice Dimension		
J	2 x 10 x 2'-0"	
K	2 x 10 x 1'-6"	

Note: Bill of Materials based on ramp length of 21', deck length of 28' and 2 stair sections of 6'-8" each.

Note: All splice blocks to be nailed to stringers to provide both lateral support at joints and bearing support. All pile bolted connections to be 1/2" x12" hex. bolt with nut and washers.

Bill of Materials		
Quan.	Item - Description	
44	2 x 6 x 20'	dressed
9	2 x 8 x 20'	dressed
5	2 x 10 x 20'	dressed
19	2 x 10 x 20'	rough
3	2 x 14 x 20'	rough
20	6" ϕ Piles @ 16'	
100	1/2"x12" hex. bolt with nut and washers	

Fig. 6 TYPICAL STRINGER LAYOUT DETAIL

Scale: 1" = 5'-0"

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PLANNING AND DEV
10
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Include as many step sections as necessary to grade from top of dune + 3 feet to base of rear dune.

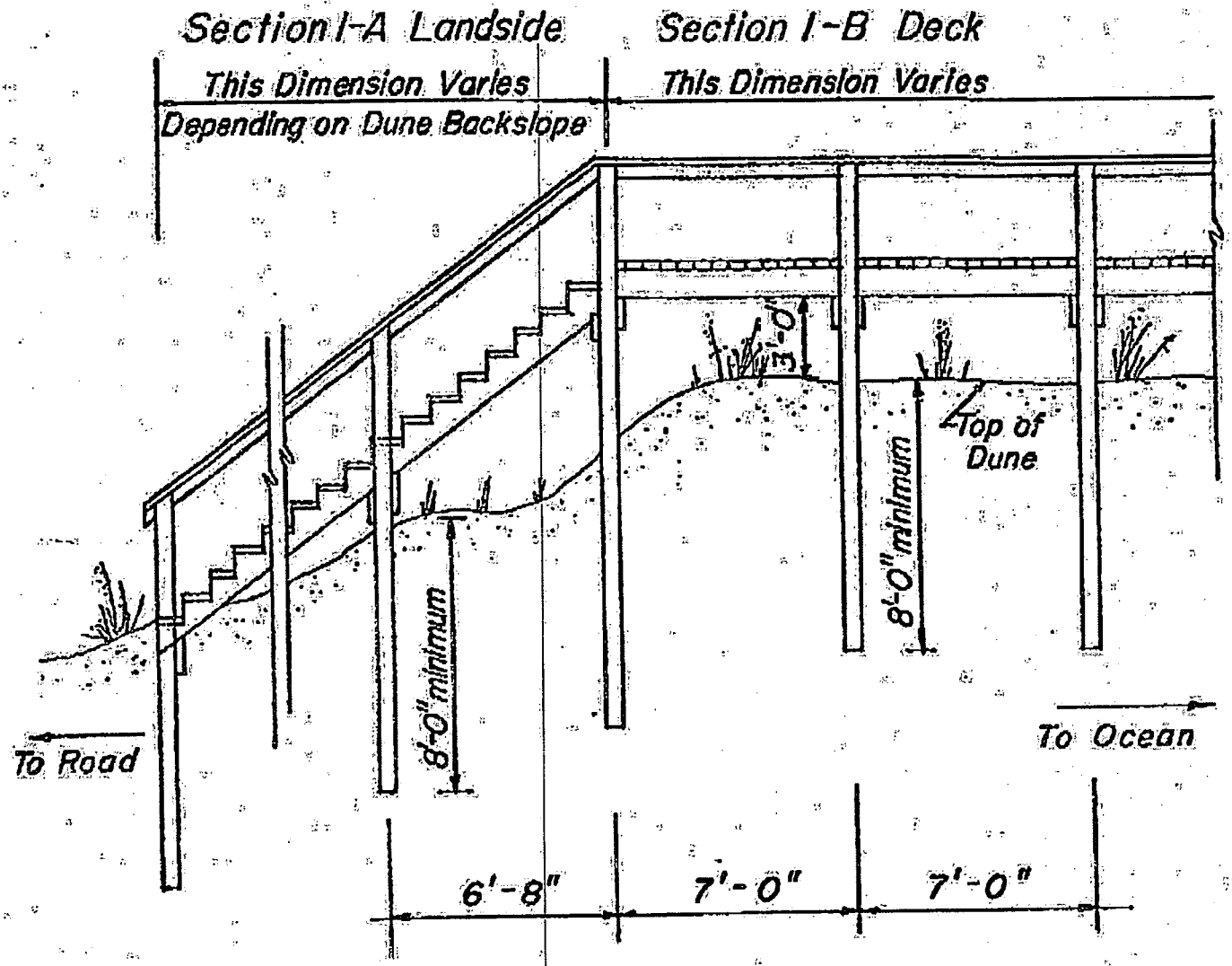
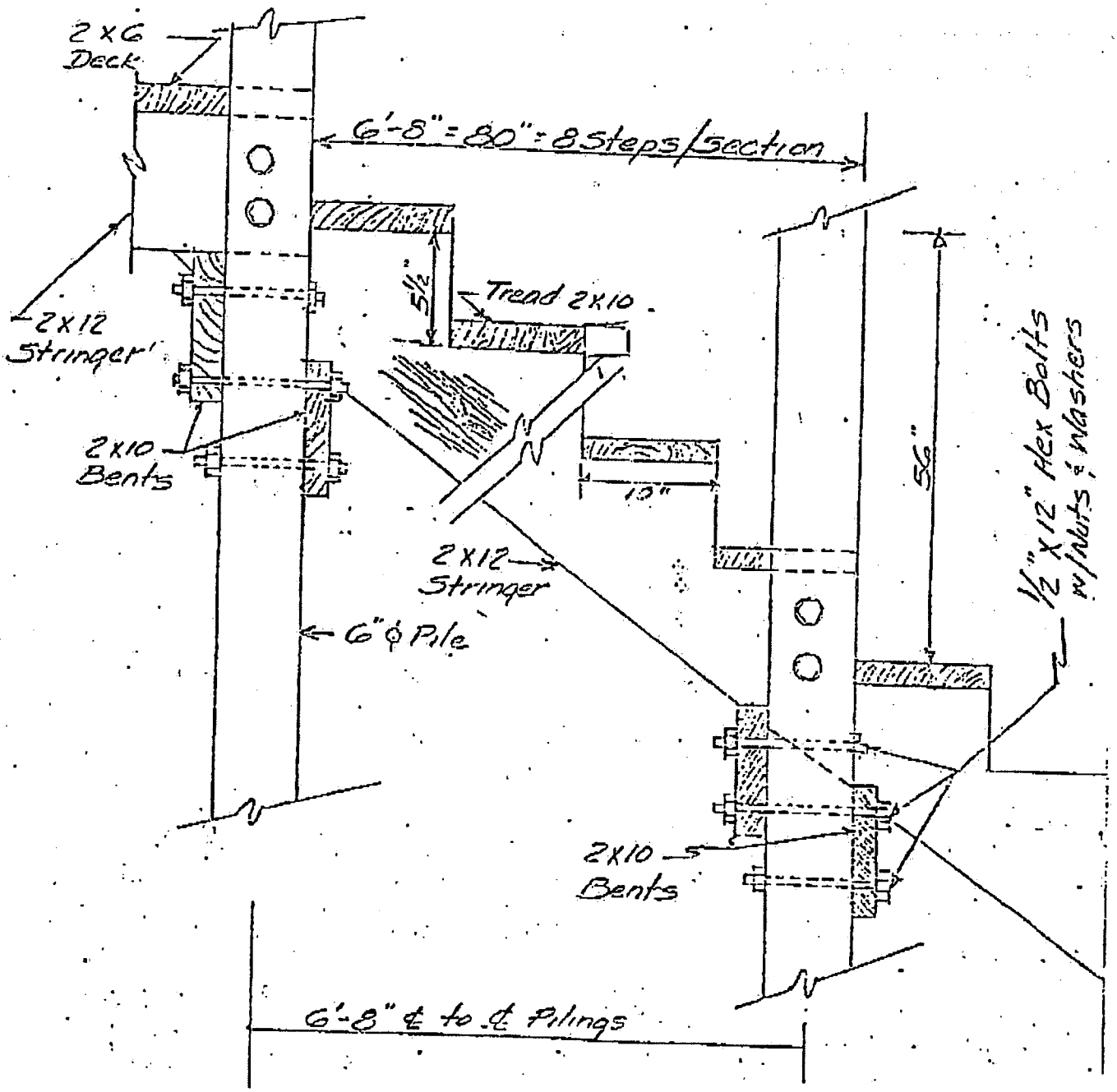
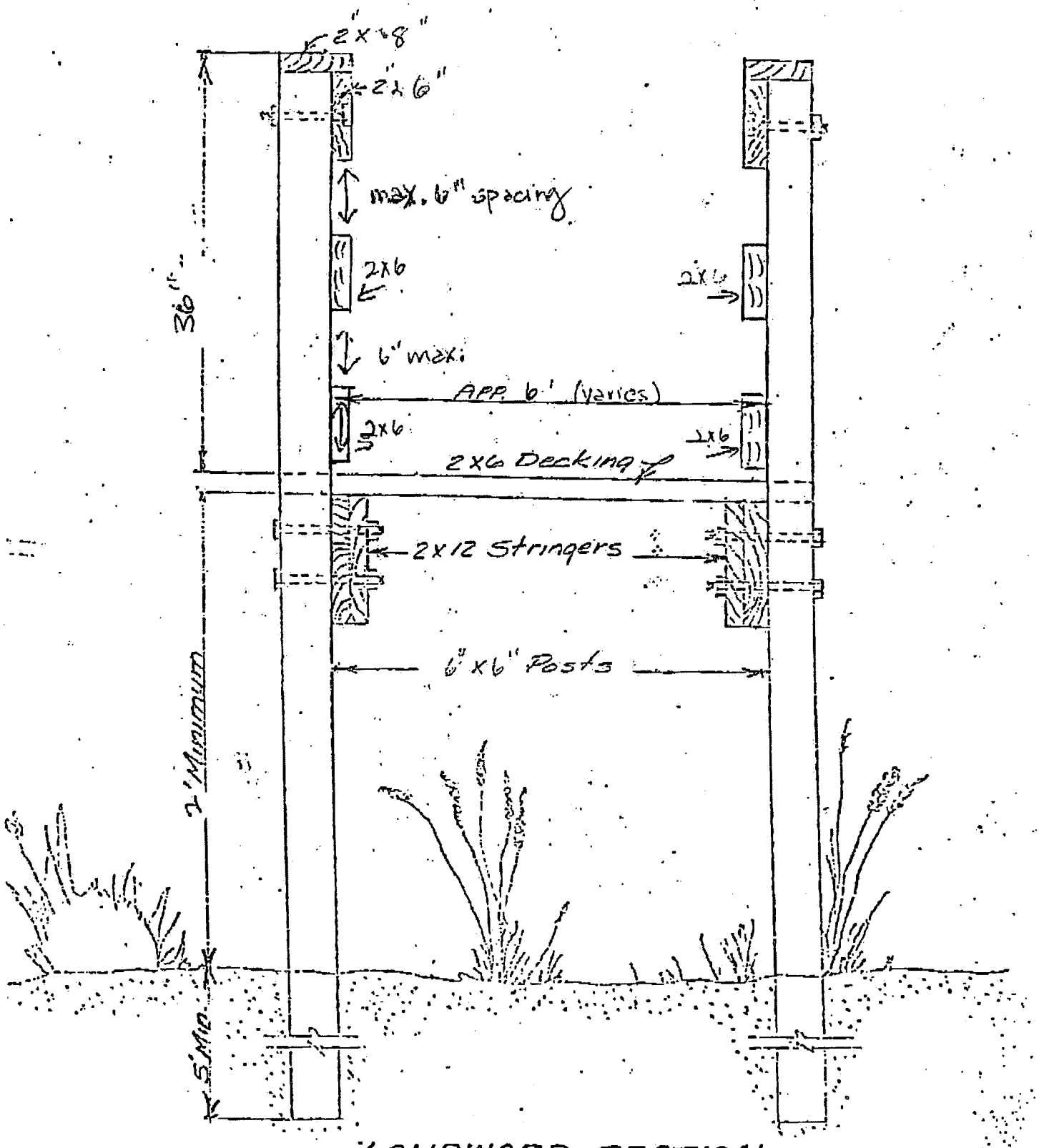


Fig.7 ALTERNATE SECTION No.1
Scale: 1" = 5'-0"
(Refer to details as per Figure 2)



TYPICAL STEPS DETAIL

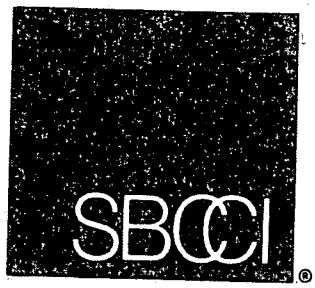
Scale: 1" = 1'



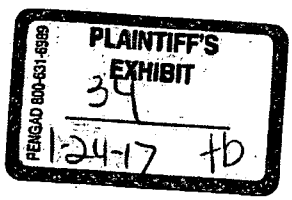
LANDWARD SECTION

DECK

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CHAPTER 23
WOOD

2301 GENERAL

2301.1 Scope

2301.1.1 The provisions of this chapter shall govern the material, design, quality, and construction of wood used in buildings or structures.

2301.1.2 The detailed structural requirements contained in this chapter are based on sound engineering principles such as those in the standards listed in this chapter and are intended for light frame construction in general use for structures having light loads (e.g., live loads of 40 psf (1.92 kPa) or less, locations in noncoastal areas) and closely spaced framing. Where additional structural requirements should be applied because of the nature of the structure, the standards in 2301.2.5 shall be accepted as good engineering practice.

2301.1.3 For heavily loaded or engineered timber construction, structural design based on the recommendations of the standards listed in 2301.2.5 shall be accepted as conformance with good engineering practices.

2301.1.4 Other sections of this chapter which are applicable shall apply to heavily loaded or engineered timber construction as well as light frame construction.

2301.2 Design

2301.2.1 The quality and design of wood members and their fastenings used for load supporting purposes shall conform to good engineering practice.

2301.2.2 All members shall be framed, anchored, tied and braced so as to develop the strength and rigidity necessary for the purposes for which they are used.

2301.2.3 Preparation, fabrication and installation of wood members and the glues, connectors, and mechanical devices for the fastening thereof shall conform to good engineering practices.

2301.2.4 For engineered wood structural panel diaphragm design, provisions of 2310 shall apply. For engineered particleboard structural diaphragm design, provisions of 2311 shall apply.

2301.2.5 The following standards shall be accepted as conforming to good engineering practice:

National Forest Products Association:

National Design Specification for Wood Construction

Wood Construction Data No. 5, Heavy Timber Construction Details.

American Institute of Timber Construction:

AITC 104, Typical Construction Details

AITC 110, Standard Appearance Grades for Structural Glued

Laminated Timber
AITC 112: Standard for Tongue-and-Groove Heavy Timber Roof Decking
AITC 113: Standard for Dimensions of Structural Glued Laminated Timber
AITC 117: Structural Glued Laminated Timber of Softwood Species
AITC 119: Standard Specifications for Hardwood Glued Laminated Timber
American Plywood Association:
APA Design/Construction Guide - Residential & Commercial
Cantilevered In-Line Joist System
Plywood Design Specifications
Plywood Design Specification Supplement 1 - Design & Fabrication of Plywood Curved Panels
Plywood Design Specification Supplement 2 - Design & Fabrication of Plywood Lumber Beams
Plywood Design Specification Supplement 3 - Design & Fabrication of Plywood Stressed Skin Panels
Plywood Design Specification Supplement 4 - Design & Fabrication of Plywood Sandwich Panels
Plywood Design Specification Supplement 5 - Design & Fabrication of All-Plywood Beams
Truss Plate Institute, Inc:
Design Specifications For Metal Plate Connected Wood Trusses
American Wood Preservers Institute:
Pole Building Design
National Particleboard Association:
Particleboard: The Ideal Floor Underlayment

2301.3 Determination of Required Sizes

2301.3.1 Wood structural members shall be of sufficient size to carry the dead and required live loads without exceeding the allowable working stresses as contained in the standards listed in 2301.2.5.

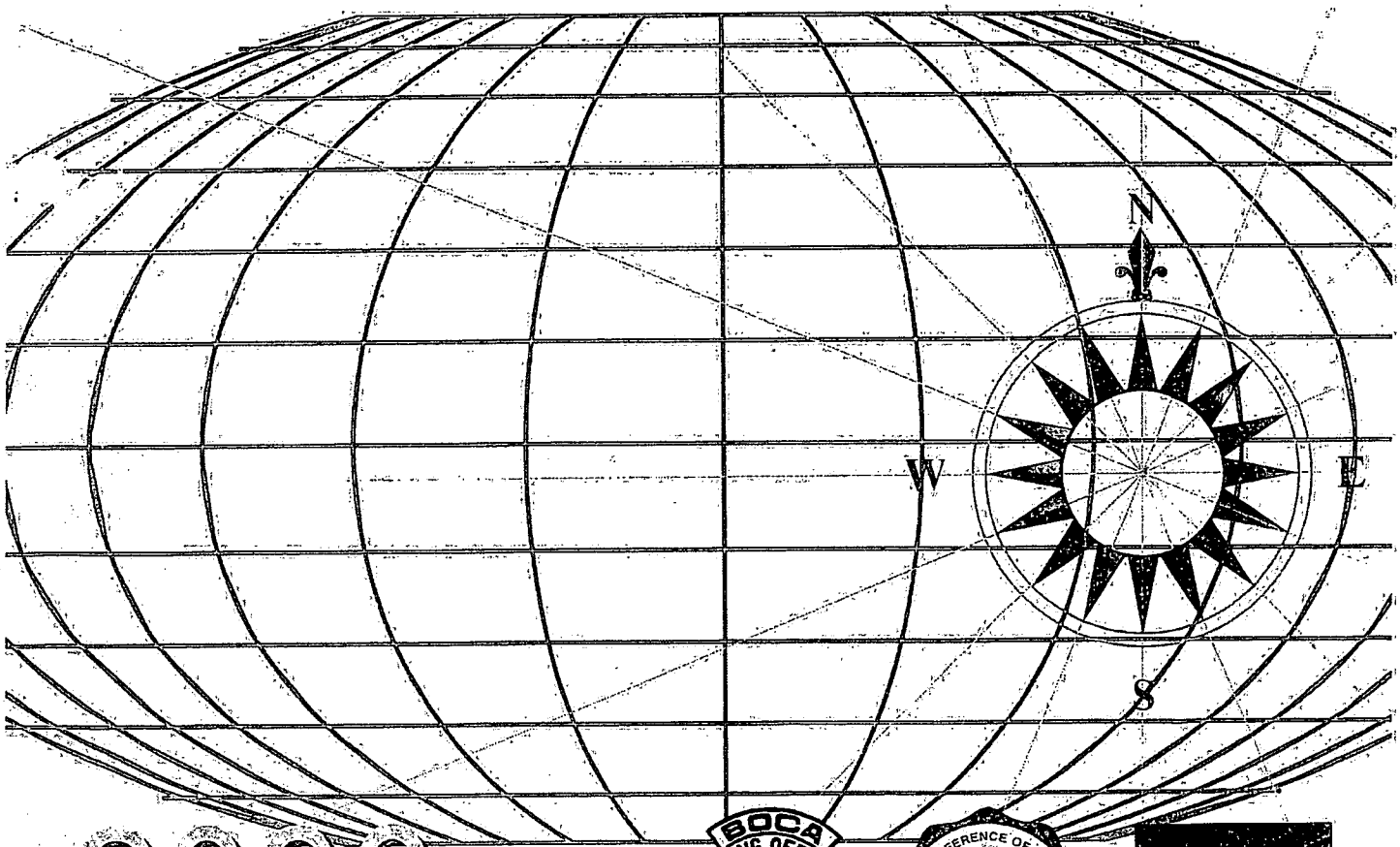
2301.3.2 Where applicable as determined by end use, allowable working stresses may be determined by machine stress rating as approved by the American Lumber Standards Committee as established by USDOC PS 20-70.

2301.3.3 Where minimum sizes of lumber members are shown herein, they shall be construed as meaning nominal sizes. Minimum dressed sizes corresponding to nominal sizes shall conform with the provisions of USDOC PS 20-70.

2301.3.4 For convenience, nominal sizes may be shown on the plans. If rough sizes or finished sizes greater or smaller than USDOC PS 20-70 dressed sizes are to be used, computations shall be predicated on such actual sizes, provided they are specified on the plans or in a statement appended thereto.

NFiPA 74-89, Household Fire Warning Equipment	905.2.1
NFiPA 75-87, Protection of Electronic Computer/Data Processing Equipment	417
NFiPA 77-88, Static Electricity	407.2.9.3
NFiPA 80-86, Fire Doors and Windows	705.1.3.1, 705.1.3.3, 1012.4
NFiPA 82-83, Incinerators, Waste and Linen Handling Systems and Equipment	409.2.17.4
NFiPA 99-87, Health Care Facilities	1024.1.5
NFiPA 102-86, Assembly Seating, Tents and Membrane Structures	T.1604.1, 3105.1
NFiPA 204M-85, Guide for Smoke and Heat Venting	1004.1.4.2, 1004.1.4.3, 3104.4
NFiPA 231-90, General Storage	903.2
NFiPA 231C-86, Rack Storage of Materials	903.2
NFiPA 253-84, Test for Critical Radiant Flux of Floor Covering Systems	803.7.2, 803.7.3, 803.7.4
NFiPA 259-87, Test Method for Potential Heat of Building Materials	2603.3, 2603.4.3, 3105.4.2
NFiPA 409-90, Standard on Aircraft Hangars	411.7.7
NFiPA 701-89, Fire Test for Flame-Resistant Textiles and Films	3103.1, 3105.4.1.1, 3106.2, 3204.2, F102.2.8
NFiPA 704-85, Identification of the Fire Hazards of Materials	407.2.5.1, 407.2.10, 407.5.8, 408.2, 408.7.1
NFoPA Design Values for Joists and Rafters, 1991	2301.5
NFoPA National Design Specification for Wood Construction, 1991 and Design Values for Wood Construction, July 1991, a Supplement to the National Design Specification	709.6.3.3, 1707.3.1, 2301.2.5, 2310.3.2, 2310.4.3, 2311.3.2, 2311.4.2, 2312.4, 2312.4.5.1,

International Building Code



2000

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SBCCI

SECTION 2306
ALLOWABLE STRESS DESIGN

2306.1 Allowable stress design. The structural analysis and construction of wood elements in structures using allowable design methods shall be in accordance with the following applicable standards:

American Forest & Paper Association.
NDS National Design Specification for Wood Construction

American Institute of Timber Construction.

AITC 104	Typical Construction Details
AITC 110	Standard Appearance Grades for Structural Glued Laminated Timber
AITC 112	Standard for Tongue-and-Groove Heavy Timber Roof Decking
AITC 113	Standard for Dimensions of Structural Glued Laminated Timber
AITC 117	Standard Specifications for Structural Glued Laminated Timber of Softwood Species
AITC 119	Structural Standard Specifications for Glued Laminated Timber of Hardwood Species
AITC A190.1	Structural Glued Laminated Timber
AITC 200	Inspection Manual
AITC 500	Determination of Design Values for Structural Glued Laminated Timber

Truss Plate Institute, Inc.

TPI 1-1995	National Design Standard for Metal-Plate Connected Wood Truss Construction

American Society of Agricultural Engineers.

ASAE EP 484.2	Diaphragm Design of Metal-Clad, Post-Frame Rectangular Buildings
ASAE 559	Design Requirements and Bending Properties for Mechanically Laminated Columns

APA—The Engineered Wood Association.
Plywood Design Specification
Plywood Design Specification Supplement 1 - Design & Fabrication of Plywood Curved Panels.
Plywood Design Specification Supplement 2 - Design & Fabrication of Plywood—Lumber beams.
Plywood Design Specification Supplement 3 - Design & Fabrication of Plywood Stressed—Skin Panels.
Plywood Design Specification Supplement 4 - Design & Fabrication of Plywood Sandwich Panels.
Plywood Design Specification Supplement 5 - Design & Fabrication of All—Plywood Beams.

EWS T300	Glulam Connection Details
EWS S560	Field Notching and Drilling of Glued Laminated Timber Beams
EWS S475	DataFile: Glued Laminated Beam Design Tables
EWS X450	Glulams in Residential Construction
EWS X440	Product and Application Guide: Glulams.
EWS R540	Builders Tips: Proper Storage and Handling of Glulam Beams

2306.1.1 Joists and rafters. The design of rafter spans is permitted to be in accordance with the AF&PA Span Tables for Joists and Rafters.

2306.1.2 Plank and beam flooring. The design of plank and beam flooring is permitted to be in accordance with the AF&PA Wood Construction Data No. 4.

2306.1.3 Treated wood stress adjustments. The allowable unit stresses for preservative-treated wood need no adjustment for treatment, but are subject to other adjustments.

The allowable unit stresses for fire-retardant-treated wood, including fastener values, shall be developed from an approved method of investigation that considers the effects of anticipated temperature and humidity to which the fire-retardant-treated wood will be subjected, the type of treatment and the redrying process. Other adjustments are applicable except that the impact load duration shall not apply.

2306.2 Wind provisions for walls.

2306.2.1 Wall stud bending stress increase. The NDS fiber stress in bending (F_b) design values for wood studs resisting wind shall be increased by the factors in Table 2306.2.1, in lieu of the 1.15 repetitive member factor, to take into consideration the load sharing and composite actions provided by the wood structural panels as defined in Section 2302.1, where the studs are designed for bending in accordance with Section 1609.6.2.1 spaced no more than 16 inches (406 mm) on center, covered on the inside with a minimum of $^1/_2$ inch (12.7 mm) gypsum board fastened in accordance with Table 2306.4.5, and sheathed on the exterior with a minimum of $^3/_8$ inch (9.5 mm) wood structural panel sheathing that is attached to the studs using a minimum of 8d common nails spaced a maximum of 6 inches o.c. (152 mm) at panel edges and 12 inches o.c. (305 mm) in the field of the panels.

TABLE 2306.2.1
WALL STUD BENDING STRESS INCREASE FACTORS

STUD SIZE	SYSTEM FACTOR
2 × 4	1.5
2 × 6	1.4
2 × 8	1.3
2 × 10	1.2
2 × 12	1.15

ACI–continued

ACI 530–99	Building Code Requirements for Masonry Structures	1405.5, 1405.5.3, 1405.5.3.1, 1405.9, 1604.3.4, 1704.5, 1704.5.1, 1704.5.2, 1704.5.3, Table 1704.5.1, Table 1704.5.3, 1708.1.1, 1708.1.2, 1708.1.3, 1708.1.4, 1805.5.2, 1811.7, 2101.2.3, 2101.2.4, 2104.1, 2104.1.1, 2106.1.1, 2106.1.1.1, 2106.1.1.2, 2106.1.1.3, 2106.1.1.4, 2106.1.1.5, 2106.1.2, 2106.1.2.1, 2106.1.2.2, 2106.1.2.3, 2106.2, 2106.4.2.1, 2106.4.2.2, 2106.5.1, 2107.1, 2107.2, 2107.2.1, 2107.2.2, 2107.2.3, 2107.2.4, 2107.2.5, 2108.6.5, 2108.7.2, 2109.1, 2109.2.3.1
ACI 530.1–99	Masonry Structures	1405.5.2, 1405.9.1, Table 1704.5.1, Table 1704.5.3, 1805.5.2, 2104.1, 2104.1.1 2108.7.2, 2109.1, 2109.2.3.1

AF&PA

American Forest & Paper Association
1111 19th St, NW Suite 800
Washington, DC 20036

Standard reference number	Title	Referenced in code section number
AF&PA/ASCE 16–95	Standard for Load and Resistance Factor Design (LRFD) for Engineered Wood Construction	2307.1
No. 4–89	Plank and Beam Framing for Residential Buildings	2306.1.2
WFCM	Wood Frame Construction Manual for One-and Two-family Dwellings, 1995 SBC High-wind Edition, Copyright 1996	1609.1.1, 2308.2
Technical Report 7–87	Basic Requirements for Permanent Wood Foundation System	1805.4.6, 1806.2, 2304.9.5
AF&PA NDS–97	Wood Construction and Supplement	720.6.3.2, 1715.1.1, 1715.1.4, 1805.4.5, 1808.1, 2306.1, 2306.2.1, 2306.3.2, Table 2306.3.1, Table 2306.4.1, 2306.3.4, 2306.3.5, 2306.4.1, 2308.2.1, Table 2308.9.3(4)
AF&PA	Span Tables for Joists and Rafters	2306.1.1, 2308.8, 2308.10.2, 2308.10.3

AHA

American Hardwood Association
1210 West N.W. Highway
Palatine, IL 60067

Standard reference number	Title	Referenced in code section number
AHA A135.4–95	Basic Hardware	1404.3.1, 2303.1.6
AHA A135.5–95	Prefinished Hardboard Paneling	2303.1.6, 2304.6.2
AHA A135.6–98	Hardboard Siding	1404.3.2, 2303.1.6
AHA 194.1–85	Cellulosic Fiber Board	2303.1.5

STATE OF SOUTH CAROLINA
COUNTY OF HORRY

COURT OF COMMON PLEAS

RICHARD CIAMPANELLA,

Plaintiff,

vs.

CASE NO.
2014-CP-26-7790

CITY OF MYRTLE BEACH,

Defendant.

DEPOSITION OF: ALAN O. CAMPBELL

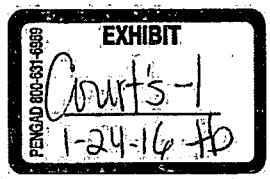
DATE: November 30, 2016

TIME: 10:33 a.m.

LOCATION: Applied Building Sciences
1890 Milford Street
Charleston, SC

TAKEN BY: Counsel for the Defendant

REPORTED BY: Lauren A. Balogh, Court Reporter



ORIGINAL

STATE OF SOUTH CAROLINA COUNTY OF HORRY	COURT OF COMMON PLEAS
RICHARD CIAMPANELLA, Plaintiff, vs. CITY OF MYRTLE BEACH, Defendant.	CASE NO. 2014-CP-26-7790

DEPOSITION OF: ALAN O. CAMPBELL

DATE: November 30, 2016

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LOCATION: Applied Building Sciences
1890 Milford Street
Charleston, SC

TAKEN BY: Counsel for the Defendant

REPORTED BY: Lauren A. Balogh, Court Reporter

ORIGINAL

APPEARANCES OF COUNSEL

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Verification of Deponent	114	1
Errata Page	115	1

DEFENDANT(S) EXHIBITS

Exhibit #	Description	Page	Line
EXHIBIT 1	Document entitled Project Setup dated Tuesday, August 9, 2016	10	10
EXHIBIT 2	Letter to Alan Campbell from Gene Connell dated November 4, 2014 with four black-and-white photographs attached	13	8
EXHIBIT 3	Colored photograph	16	20
EXHIBIT 4	Affidavit of Alan O. Campbell	73	7
EXHIBIT 5	Colored photograph	87	18
EXHIBIT 6	Colored photograph	87	20

STIPULATION: It is stipulated by and among Counsel that this deposition is being taken in accordance with the South Carolina Rules of Civil Procedure, Rule 30; that all objections except as to form are reserved until the time of trial; and that the deponent does not waive reading and signing of this deposition.

* * * * * * * * * *

ALAN O. CAMPBELL, P.E., being first duly sworn, testified as follows:

EXAMINATION

BY MR. BRYAN:

Q. All right. Mr. Campbell, for the record, I'm Will Bryan. I represent the City of Myrtle Beach. And just so that we're clear, if you don't understand my question or if you don't hear me clearly, please ask me to restate or rephrase my question.

A. All right.

Q. Is that understood?

A. Sure.

Q. Okay. And Mr. Campbell, if you answer my question, may I assume that you've understood my question?

A. Okay.

Q. If you have any questions about today's deposition, please direct your questions to me. If you need a break for any reason, let me know and we'll take a break to take a phone call, restroom break, whatever the case may be; otherwise, we'll plow along, and I don't think this will take too long.

A. All right.

MR. HANNA: Don't promise anything, Will.

MR. BRYAN: I said I don't think this will take too long, but I guess that's maybe relative.

BY MR. BRYAN:

Q. All right. Well, let's see. You have been identified as an expert witness in our case involving Mr. Richard Ciampanella, and you have -- you provided plaintiff's counsel an affidavit. I want to talk to you about that, but I guess first a good place to start might be what information is in your file. You produced a number of things to me this morning, but previously we issued a subpoena to your office earlier in the year, and at that time we got -- I'll just show you. This is the, I

guess, original subpoena response.

A. Correct, yeah. And I don't know when your subpoena came out, whatever it was, our file was probably fairly limited at the time. And I'll tell you, I just got started. It looks like -- and I had to go dig it up. It looks like Gene wrote me a letter, and you've seen it in the file, produced November 4th, 2014. And Gene sometimes works fairly informally, and just sent this over to me and says, here, what do you think? Because sometimes he asks me opinions, and sometimes I'll say, well, I think it's legit or sometimes I don't, and sometimes we'll turn cases down. So he asked me about this one. I think I responded back, and then nothing happened for probably two years. I think maybe back -- maybe we -- let's see when he actually officially told us we're going to move forward and start working. It looks like we officially opened the file on August 9th, 2016. You probably have a copy of that. That's our case opening form. Do you have that?

Q. That would have been --

A. That should have been produced as well, I would think.

Q. I don't know that it would have been

produced.

A. If not, we can make a copy of it.

Q. Your production may have been prior to --

A. Yeah, that's what I'm saying. It was very informal. Because I think your subpoena may have actually prompted me to go back and look and say, you know, I remember that, but we haven't done anything on it.

Q. Okay. So --

A. Because I really hadn't done anything on it until we started getting ready for the deposition, or I guess when I wrote the affidavit, that was the first work I had actually done on the case. And that affidavit was dated September 1st, 2016. So we opened our file August 9th; sent out the affidavit August 9th -- I mean, September 1st. So anything prior to August 9th was just nothing more than just this informal letter with some photographs and said, what do you think.

Q. That's, like, a file opening sheet?

A. Correct.

Q. I don't think I have that.

A. Do you want me to make you a copy real quick?

Q. That and -- are there -- whatever billing

records you have. Do you have...

A. Well, there's no bill because we haven't done anything. We just started working, really, the affidavit.

Q. Do you keep your time?

(Witness making a phone call.)

(Off the record.)

BY MR. BRYAN:

Q. But you're -- a bill might not have gone out, but you are billing the file --

A. Oh, yeah.

Q. -- over time?

A. We'll bill the file, correct.

Q. But there -- so --

A. So I've probably got maybe an hour, hour and a half in the affidavit. We've got a little bit of time in the affidavit, which we didn't bill that because I think we actually already had a retainer.

Q. But you could generate a document, a bill, a pre-bill, that shows the work performed to date even though it may not have gone to Mr. Connell or Mr. Hanna?

A. We wouldn't have a pre-bill right now, but, I mean, we will have a bill that will probably go out probably next week or so, and we will be glad

to provide you a copy of that.

Q. You can't just with a keystroke just say --

A. No, because it doesn't exist right now, but we do have -- here's something else. About that same time frame, when we opened the file on August 9th, we also sent a retainer agreement. So that's what we have.

Q. How much time -- like, just talking about the billing aspect of this, how much time have you billed to this file?

A. It's not a whole lot. I mean --

Q. But that's information you can find out?

A. Oh, yeah, yeah. I mean, I can tell you off the top of my head, because I worked some yesterday on it, and worked probably another hour, hour and a half this morning. Bobby and Steph were informally checking on a couple of things this morning. So the grand total, I would say we probably got -- even adding their time -- no more than eight hours. That would be the affidavit, deposition prep yesterday and this morning. And that's probably on the high side.

Q. And the date at the top right, Tuesday, August 9, that's the file opening date?

A. Yeah. And you'll see down, left side, three

up from the bottom in the middle, request date, the same date.

Q. Request date.

A. Yeah.

Q. Okay.

A. So sometimes those will coincide; sometimes they won't.

MR. BRYAN: Okay. Let's make this an exhibit.

(EXHIBIT 1, Document entitled Project Setup dated Tuesday, August 9, 2016, was marked for identification.)

THE WITNESS: Unless there's something real critical, we don't keep tight controls on those dates. Usually -- especially this one since Gene sent his letter out, and then two years later he says, hey, oh, by the way, can we do an affidavit. So it was pretty informal over a two-year period.

And it was not a lot of work on our part. It's not like it required any -- a federal court report or a site visit or anything like that, or any calculations.

BY MR. BRYAN:

Q. How much time did you have on the file -- or

how much time did you put on this file, let's say, in between the file opening date of August 9 and the date of the affidavit of --

A. September 1st.

Q. -- September 1st was prepared?

A. Like I said, I've probably got maybe an hour, hour and a half in that affidavit. I'd have to go back and look.

Q. What was in your file at that time?

A. What you have; that set of photographs.

Q. That's from the original --

A. Yes, the original letter, yeah, November 4th, 2014. That was it.

No, wait. Your question was at the time of the affidavit what was in my file?

Q. Yeah.

A. Okay. So that would have been -- we did a retainer agreement, which I have here. We had Gene's letter with the photographs attached, and then we had our case opening document, which you've made as Exhibit 1. That's all I would have had.

Q. And this letter, November 4, with -- there were --

A. Four photographs attached. Let me make sure that's correct. Correct, four photos.

Q. Can I see those four? I'll give them back. Do you recognize that photograph?

A. That was one that was e-mailed to me. I can check the date if I need to, but it was e-mailed to me fairly recently. Other than that --

Q. Okay.

A. -- I don't know -- I could probably open the e-mail and click on it and find out when it was taken.

Q. That was not part of --

A. No.

Q. -- Mr. Connell's letter to you November 4th, 2014?

A. No, this was just recently provided.

Q. Okay. All right. So the photographs you would have had at the time you prepared the affidavit would have been the four black and whites provided by Mr. Connell?

A. The ones attached to that letter.

Q. Okay.

A. That was what I received.

Q. All right.

A. I don't think we ever got the hard copy of the letter. That was sent by e-mail.

Q. Yeah, I noticed that. I've got the e-mail

here.

A. Correct.

And as Gene usually does, he's usually fairly informal; said, hey, what do you think? And I'll tell him yea or nay.

Q. All right.

MR. BRYAN: Let's mark that Exhibit 2.

(EXHIBIT 2, Letter to Alan Campbell from Gene Connell dated November 4, 2014 with four black-and-white photographs attached, was marked for identification.)

BY MR. BRYAN:

Q. All right. So Mr. Campbell, we've marked a letter with four photographs. This is the November 4, 2014 letter from Mr. Connell. Is that a -- is Exhibit 2 a true and accurate copy of the package that you received from Mr. Connell on that date?

A. Yes, sir.

Q. Okay.

A. It's from an e-mail, but we printed it out and put it in the file.

Q. Understood. Understood.

And so your file at the time you prepared the affidavit would have consisted of

Exhibit 2 and also your -- and Exhibit 1, the file opening sheet?

A. Correct.

Q. Would that be it?

A. Retainer agreement.

Q. And retainer agreement?

A. Correct.

Q. Okay. Mr. Campbell, do you know when the pictures that are part of Exhibit 2 were taken?

A. I don't know. I could -- as of this morning, I had a digital file of those. I can try to click on them and see what the properties are, if you want to do that.

Q. Okay. But as we're sitting here, you're not sure when those photographs in Exhibit 2 were taken?

A. Obviously prior to November 4th, 2014. And if they are actual photos of the area of the incident, then sometime after -- sometime on or after August 19th. So somewhere during that two-to-three-month period.

Q. Okay. Did you go to the walkover before drafting your affidavit of September 1st --

A. No.

Q. -- 2016?

A. It had already been repaired. I was not -- either not available or not requested to examine at the time of repair.

Q. Okay. So just so the record is clear, you had not laid eyes on the walkover and railing prior to formulating your opinions?

A. It depends on how we define that. I mean, certainly I examined photos. I had not physically seen it or touched it other than through photographs.

Q. Okay. You have not physically been to the scene?

A. Correct.

Q. Okay. Mr. Campbell, do you have any -- well, additional pictures in your file now other than the ones that were made part of Exhibit 2?

A. I do.

Q. I know we've -- I've got a color photograph here that we have. How about besides this color photograph?

A. I have a collection of photographs that I received this morning from Mr. Hanna.

Q. Okay. And then you also received this photograph; we'll mark it as Exhibit 3. You received it sometime -- would it have been after

August 9, 2016?

A. I can verify. I would say almost certainly it was after that date, but I can double check, if I need to.

Q. Well, in fact, it would be after the affidavit date. It was not in your file at the time of the affidavit?

A. It should be -- let me check real quick.

Q. Okay.

A. Whatever is in our folder, I mean, we always date it.

Q. Okay.

A. And it should be the same as on your flash drive, whatever was on there. Your flash drive may not have much since then.

Q. I'm going to have --

A. Being it came in early.

Q. I'm going to have the court reporter mark this photograph.

(EXHIBIT 3, Colored photograph, was marked for identification.)

THE WITNESS: I'll take that back. It looks like I have that photo dated 3/16 when it came in.

BY MR. BRYAN:

Q. Now, this is Exhibit 3, the color photograph?

A. Correct.

Q. And that date again was March 16th?

A. March 16, 2016. So I can go back and check it. I'm sure it came in through an e-mail.

Q. Do you know what is depicted in Exhibit 3, whether or not that's the 77th Avenue North walkover or a different walkover or somebody's personal walk from their house to the beach?

A. I really could not tell you.

Q. Okay.

A. Actually I think that photo was sent the same time as the other one. So it looks like I forwarded it from Gene because I forwarded this to Lisa from my file. Let me go to that original e-mail.

Q. And we're talking about Exhibit 3?

A. Correct.

For some reason -- I mean, I can check it later. For some reason our server is not going back more than 12 months right now.

MR. BRYAN: Here you go. Pass that --

THE WITNESS: If you need to verify that --

MR. BRYAN: It's a full copy of the four black-and-whites and the color -- the back -- that color photo is at the back.

THE WITNESS: If you want to take two minutes -- I'm on our network. For some reason it's not going back. I can go to my hardwired Ethernet connection and check it to verify that.

MR. BRYAN: Sure.

THE WITNESS: Okay.

(Off the record.)

THE WITNESS: All right. If it helps, I got on my computer e-mails to see it. That photo did not come in with Exhibit 2, and it was actually taken pre-accident, the June 2013 photo. I've got it on my computer if you want to see the properties.

BY MR. BRYAN:

Q. So Exhibit 3 was, first of all, not part of Exhibit 2?

A. Correct.

Q. It was not forwarded to you under the -- Mr. Connell's November 4, 2014 cover letter?

A. It did not come with the cover letter.

Q. All right. And you believe that the

photograph was actually taken in June of 2013?

A. That's what it shows. If you want to look at it just to verify.

Q. Now, what are you looking at that tells you --

A. You right click on it; it gives you the properties. That's why I was asking if you guys all want to see it just to verify that we're looking at the right information since that's what I'm testifying.

Q. The information you right click on, does it tell you the camera from which the photograph was taken?

A. We can look. Do you want to look?

Q. I would like to know who took the photograph.

A. I don't think it says that. It might say a model number of the camera. I don't know.

(Off the record.)

THE WITNESS: Just so we're on the record, Will did ask one question, like could the date stamp be wrong. I mean, if whoever took the photo didn't program the proper date stamp on their camera.

MR. CONNELL: Right.

THE WITNESS: I don't know that it's relevant.

MR. CONNELL: It must be from another file or something.

THE WITNESS: Yeah, it doesn't look like the same -- I don't think it's relevant.

MR. BRYAN: Okay.

THE WITNESS: It's not relevant to me, let's say that. If everybody needs to dig into it deeper, go for it --

MR. CONNELL: It looks like a stepdown.

THE WITNESS: -- but I don't think it's relevant to me. I don't think it's relevant to my opinions.

MR. BRYAN: Okay.

THE WITNESS: So that may make it easier not to even get into it.

MR. BRYAN: All right.

THE WITNESS: But if the date stamp is correct, it's pre-accident anyway.

BY MR. BRYAN:

Q. And I think the date stamp was June 27?

A. 2013, correct.

Q. Okay. We got on this line -- we got on this

discussion because I was asking -- trying to figure out what other photographs are in your file now.

A. Right.

Q. We've got this one, and then you received a series of photographs --

A. This morning.

Q. -- today?

A. They seemed to be probably taken at the same time as these photos, and they're very similar. Some of them are more wide angle; some are more close-ups; some show a screw corrosion, the same -- those do appear to be the same dune walkover. I did not check the date stamp on those.

Q. Do you have those with you?

A. Sure. I've got them right here. Do you want to see them?

Q. Sure.

Oh, they're on the computer?

A. Yeah. They're on that computer, too, but it's probably easier to pull them up right here.

Q. Well, if they're on the computer, let's not worry about it right now.

A. Okay.

MR. CONNELL: You can probably print them if you want to see.

THE WITNESS: Yeah, if you want me to forward --

BY MR. BRYAN:

Q. Can you forward it to Catherine?

A. Yeah, I'll forward it to Catherine and get her to print them, sure.

Q. Okay.

(Off the record.)

BY MR. BRYAN:

Q. And the photographs that you received this morning, do you know when those photographs were taken?

A. That's exactly what I'm going to do right now.

November 30th, 2016, 10:00 in the morning.

Q. That's when they were taken?

A. Correct.

Wait a minute. That's clearly not right.

MR. HANNA: That's today. They were sent today.

THE WITNESS: Yeah. All right. It's not on here. I don't know.

BY MR. BRYAN:

Q. Are they all right there?

A. Yep.

Q. Can you scroll through a couple of them?

A. It's not giving us anything new.

Q. Okay.

A. It looks like they're very similar to the other ones, whoever took the photos. I don't know why it doesn't have the date on these.

Q. All right. Well, do you know when the photographs that you received this morning were taken?

A. That's what these are. These are the ones I received this morning.

Q. Right. Do you know when those photographs were taken?

A. I don't have an exact date. I think they were taken around the same time frame as the Exhibit 2 photos.

Q. Exhibit 2 photos, you said -- you gave me a range, like taken after the incident date, but prior to the date that you received them from Mr. Connell.

A. Well, in fact, I think these are the same group of photos, because if I'm looking at the third photo in series, it is exactly the same photo.

Q. But do you know when any of those photos --

A. Well, as I said, no. These would have been taken somewhere between the time of the incident and the date of the letter, between October 19th, 2014 and November 4th, 2014. So sometime during that two-and-a-half-month period.

Q. Okay. Do you have any photographs that depict the walkover and railing taken before Mr. Ciampanella's incident that would show the walkover and railing as it existed on the date of his incident, which was August 19, 2014?

A. I do not.

Q. Okay.

A. I would just say since there's no date on here, his camera must not have had a date stamp feature or he had it turned off.

Q. Okay.

A. And you can do that if you don't want to include that.

Q. And you also don't have any photographs that would show that the walkover and railing in its -- as it existed at the time of its original construction?

A. No, sir.

Q. Mr. Campbell, do you know when the walkover and railing were first constructed?

A. Let me check one document.

No, I don't have any information on that. There should be -- I don't know if anybody's requested it, but there should be a permit through the DHEC, OCRM, Corps of Engineers, for construction of those walkovers.

Q. Would the permitting process have been the same, let's say, 25 years ago? If it was built 25 years ago, do you think the permitting -- do you know the permitting process that exists today would have been the same 25 years ago?

A. Well, it's even changed jurisdiction. We used to have the Coastal Council many years ago, and then it went to OCRM, so I don't know what has evolved during those changes.

Q. Okay. Do you know who built the walkover at 77th Avenue North in Myrtle Beach?

A. Well, apparently the parties that were asked don't know -- through the City of Myrtle Beach, and they don't know. I do not know either.

Q. Okay.

A. I think the City of Myrtle Beach, I guess, has ownership and maintenance responsibilities, but as far as design permitting and construction, I don't know anything about that.

Q. Okay. Do you know if the walkover was originally built with a railing?

A. No.

Q. Is it true that in this case, based on the specs of the walkover, that a railing would not have been required?

A. Yeah, I don't see that a rail would have been required.

Q. Okay.

A. I would agree with that.

Q. So just so I understand, a railing -- the walkover could have been built without a railing at all?

A. I think so. I think it could have been.

Q. Okay. And that's because it's less than, like, so many inches off the ground?

A. Well, there's a couple of different ways of looking at it. There are industry standards and then there are building codes. And I'm not sure if this comes under the building code or not. I'll show you a document that I have that I just recently retrieved.

So if dune walkovers are built now, then they must be built in accordance with the 2015 International Building Code. What documents

covered them then, I do not know. If you go by the building code, the building code states that decks, walks, patios, structures of that nature, that are less than 30 inches above grade do not require handrails or guardrails.

Q. So a walkover that is less than 30 inches above grade, would that be the same as above ground?

A. Correct. Grade is considered ground.

Q. Okay. So a walkover that is less than 30 inches off the ground does not require a handrail, per the building code?

A. If you built it today.

And let's make sure we know the difference. A handrail is the part that you grasp. A guardrail is the part that stops you from falling over. So technically this would be a guardrail.

Q. Okay.

A. It's actually a combination, guardrail and handrail. But the guard guards you from falling. The handrail is just what you can grasp around.

Q. All right.

A. And grip.

Q. Let me ask a different question.

Does the walkover at 77th Avenue North,

Myrtle Beach require a guardrail?

A. Not in accordance with the building code.

Q. Okay.

A. But there are industry standards that govern the construction of those walkovers, and they certainly -- those details show guardrails, and show very clear details how those guardrails should be constructed. And those are dune walkover guidelines.

Here's one detail from a dune walkover guidance from the Coastal Construction Manual. There's a rail detail.

Q. And it's from, you said, what?

A. The Coastal Construction Manual.

I think this is from DHEC. I'll have to verify that. Sand Dune Management. We have the same detail -- pretty much the same detail in this document.

Q. And this is from, you thought, DHEC?

A. Yeah, I'm pretty sure. I'll have to verify, but I'm pretty certain it's DHEC.

Q. All right. But the International Building Code doesn't require -- in this instance, with the 77th Avenue North beach walkover, doesn't require a handrail or a guardrail?

A. It doesn't require it. But the other side of that is if you build a handrail or guardrail, you need to construct it and maintain it properly.

Q. That's fine.

A. If you looked at the strict requirements of the IBC, as we'll call it, if it's less than 30 inches above grade, no guardrail required.

Q. No guardrail or handrail required?

A. Correct.

Q. Okay.

A. And the handrail becomes a technicality because if you have stairs, treads and risers, and you're going down, depending on the number of treads and risers you have, a handrail may be required.

Q. But not at a flat walkover section?

A. Correct.

Q. Okay.

A. And this is not a handrail case, so I think that's a moot point.

Q. Okay. Now, Mr. Campbell, had you -- when did you pull these; like, for instance, the Sand Dune Management and the Dune Walkover Guidance documents?

A. These actually came from another case that

we had. They're documents from our files.

Q. But when did you pull them in connection with this file?

A. Oh. I knew we had them. We pulled them this morning just to have as exhibits.

Here's another one from DHEC showing the same thing, but it's pretty much all the same information.

MR. CONNELL: Are you going to mark those as exhibits, Will, or not.

MR. BRYAN: I don't know. Maybe.

MR. CONNELL: If not, I would like to mark them because I'm going to get confused when I go back and read this thing.

THE WITNESS: Or if you don't want to mark them, we can just make copies and send them to all of you guys. However you want to handle it.

BY MR. BRYAN:

Q. Mr. Campbell, were these documents, the three that we just talked about, was it part of your analysis in formulating and drafting your affidavit of October 1st -- September 1st?

A. No.

Q. Okay.

A. And I would say not directly. I mean, obviously we've worked on a lot of rail cases, and know the rail standards, and for me with the industry standards and building codes, but I did not specifically pull them and review them. Only, I would say, it's just information that is sometimes, as we say, head knowledge.

Q. Okay.

A. I was aware of it, but I did not pull it or review it.

Q. After the 77th Avenue North walkover was built, do you know if it was ever damaged and then renovated or completely razed and rebuilt again at some time?

A. I don't have any records of that. I do know that it was scheduled for replacement probably around the time or shortly thereafter the accident.

I'll show you this document. And through my preparation of this deposition, I have not seen that document produced by anybody else.

Q. All right. What am I looking at?

Okay. So if I'm reading this correctly, what I've got here is a resolution adopted by the mayor to adopt the 2012 Beach Management Plan for the city?

A. Correct.

Q. And then you've tabbed it, but that plan -- it has a number of provisions, but the plan is to replace -- there are about 40 walkovers to be replaced --

A. It's, like, six to seven per year, starting in 2010.

Q. Six or seven per year over the next ten years?

A. Correct, starting in 2010. So if you do the quick math, six to seven per year starting in 2010, five per year is 30 over five years; seven per year is 35. That's number 33. I'm just kind of backing into it. That would be real close to the 2014 replacement schedule.

Q. What number street is the 77th Avenue North?

A. 33.

Q. 33?

A. Yeah. It should be marked on there. Highlighted.

Q. Oh, I see it in the middle.

A. Right, yeah.

So six to seven per year, that's 30 to 35 between 2010 and 2014. '10, '11, '12, '13, '14, so it's getting close.

Q. So in this schedule it would be in the --
A. Getting real close.
Q. -- fifth year --
A. In the fifth year.
Q. -- replacement --
A. Getting real close, yeah, correct.

Obviously it didn't make it, but it was getting close. I would say within a 12-month period that one was probably going to go next.

Q. After the incident?
A. Probably. I mean, we have --
Q. Depending on their schedule?
A. Yeah, absolutely. Obviously you've got to talk to those guys. Did they do it; did they meet that schedule, but just based on that document, their goal was to get it probably sometime -- probably within 12 months of the accident, in that time frame. So it was ending -- it was nearing the end of its useful life, based on their analysis or --
Q. Do you know why the decision was made to, I guess, renovate the 40 walkovers?
A. I can only speculate.
Q. Okay.
A. Capital improvements, maintenance,

construction, safety. I don't know.

Q. Okay.

A. It's a good question for them. Why do they do it? What do they see is the need, the justification, the funding, the mandate, whatever. It was certainly considered for various reasons.

MR. BRYAN: Let's take a break.

THE WITNESS: All right.

(A recess transpired from 11:25 a.m. until 11:32 a.m.)

BY MR. BRYAN:

Q. All right. Getting back to my earlier question about if you -- after the original construction of the 77th Avenue North walkover, are you aware of any renovations that occurred, any changes that occurred, after the original construction?

A. No. What I have are three deposition transcripts of Myrtle Beach employees or employees that had some involvement or some responsibility for these walkways, and based on what I've seen, based on their testimony, based on the exhibits, nobody is aware of any repairs other than the repairs, obviously, on August 20th. But pre any modifications, alterations, maintenance-related

repairs, I don't have any information based on that.

Q. Those gentlemen, they testified that there were inspections performed --

A. There were.

Q. -- looking for things to replace or what have you?

A. Yes, sir.

Q. Okay. And those inspections would have included 77th Avenue North?

A. Based on their records and the testimony, correct.

Q. Okay.

A. Prior to probably back in June of 2014, I think the 77th Avenue walkover was inspected.

Q. Yes.

Do you know the types of screws that were used, I guess, during the original construction of the 77th Avenue North walkover?

A. Well, there -- it appeared to be a wood screw. Based upon the testimony, they were galvanized. And I think they may have even made testimony they were a three-inch galvanized wood screw. Sometimes we call it a bugle-head screw because the head is tapered; looks kind of like a

bugle.

Q. Now, is that testimony that that's what was there at the time of the incident or that's the screws that were used at the time of the original construction?

A. Well -- and I'm not sure that's actually truly nailed down. I mean, Anderson testified that the -- Anderson, and I think Edsel as well, and Edsel did not testify, but there was information in the file that they observed the screws. The screws had corroded so excessively that they had separated. But as far as the exact type and size, I mean, I don't think anybody knows. You'd have to go back to the post. You'd have to extract the screw. You'd have to measure the diameter. You would have to get fairly technical, if that matters.

Q. You're talking about the screws, though, that were in place at the time of the incident?

A. At the time of the failure, correct.

Q. All right. Let's go back to the other question.

Do you know the types of screws that were used at the time of construction, the original construction?

A. No, I don't because I don't know when it was constructed or if there had been any modifications or alterations over the years, and if those screws -- the rails had been replaced, the posts had been replaced. And I never had the opportunity to examine the post at the time of the failure, so there's really too many unknowns to be able to answer that question accurately or specifically.

Q. All right.

A. What we know is that there was excessive corrosion, the fastener failed, the rail detached, and Mr. Ciampanella was injured. I think that's the bottom line.

Q. When you say the fastener failed, what is the fastener?

A. The fastener would be the screw.

Q. Okay.

A. A generic kind of technical term. We call them fasteners.

Q. All right.

A. Nails, screws, bolts, whatever they may be. The fastener failed from corrosion.

Q. Can a screw show no outward signs of corrosion but yet be internally corroding without giving any -- without the outward appearance of the

screws showing evidence of that?

A. Actually we have a case like that right now. There's a very specific type of corrosion called stress corrosion cracking where there is no outward sign of corrosion whatsoever, but it's really a breakdown of the bond between the grains of the steel. And I can show you one of those fasteners. They're stainless steel fasteners, and they become very brittle, and actually snap like a piece of plastic. But that's not what we have here. We have standard normal-type everyday corrosion, to call it generically. It has nothing to do with stress corrosion cracking.

Generally when you have this type of corrosion, the heads will corrode. And if you look, you can see that there is some evidence of corrosion in the wood through, like, volumetric expansion through oxidation of the metal or there may be leaching or there may be some separation at the connection.

Q. Have you seen the screws that were used or in use?

A. I have. I've seen a close-up of the photos. And I don't think we actually have a close-up, but there's one that's close enough that you can see

the head of the screw does appear to be corroding. But, yeah, as far as the majority of the fastener, it is concealed with the exception of the head.

Catherine said that Tim rebooted our firewall, so she's just now printing the photos. So she'll have those photos printed in a couple of minutes, and we can look at the ones I'm talking about where you can actually see the dark color of the head of the fastener.

Q. Okay. And the screws you're talking about that were in place at the time of this incident, do you believe -- I know the testimony of some of the city employees was that they were three-inch galvanized wood screws.

A. Correct.

Q. Having -- from whatever you can gain from the photographs, do you agree with that?

A. It seems reasonable. And that would be typical, too. That's a very common length. You've got an inch and a half of two-by-four to go through, and you like to have about an inch and a half of embedment. So it passes through the two by four into the post, and that would give you an inch and a half. That's very common to have a three-inch wood screw.

Q. Okay. Mr. Campbell, the screws, do you know if they're -- I mean, do screws go by numbers, like a number ten or a number eight, number nine?

A. They do. Usually like a 10, 12 or 14.

Q. Okay. Do you know in this case whether the screws at the time of the incident were -- do you know what number -- if it was a number 10 or a 12 or what have you?

A. It's hard to say. That could be probably like a number 10 or number 12.

Q. Okay. What does a 10 or 12 mean?

A. The easiest way to -- the easiest way to recognize those is a number 14 is almost a quarter inch in diameter. So 14 almost being like one-four --

Q. Yes.

A. -- is almost a quarter inch in diameter; it's kind of a rule of thumb. So smaller than 14, smaller diameter.

Q. Okay.

A. So it's going to be a little bit smaller, closer to the 1/8th or 3/16ths range when you get down in that kind of 10 and 12 range. A number 14 screw is a pretty good size screw. You generally would not use that for a deck board because it

would probably split the two-by-four when it went through it.

Q. Do you think you're looking there at a number 10 or a 12?

A. Probably, yeah.

Q. Okay. That would be appropriate?

A. I would say so, yeah, probably.

Q. Okay. If these are three-inch galvanized screws, you believe that at the time of the incident you've got -- I think you explained earlier about an inch and half of embedment --

A. Correct.

Q. -- into the post?

A. Into the post, correct.

Q. Okay. Let's talk about the -- at the time of the original construction, do you know how much embedment or the depth of the screws that were used at the time of construction?

A. Not originally, no.

Q. Do you know how many screws were used to fasten the side railings, the side rail, to the post at the time of the original construction?

A. If the side rails configure in the same manner as these photos, and we're talking about time of original construction, and we don't know

when that was, but it was very similar to this, I would say the best they could have done was probably two, just because there's a butt joint right there where it failed. It's not running continuously. The point I'm making is that there's a butt joint at the post, so you probably can't get any more than two. If you get too close to the edge, you're going to split it. If you get too far this way, you're going to miss. I mean, you could go in as an angle or a toenail, toe screw, but they're generally just going to put two face screws.

Q. But you are -- that's an assumption you're making?

A. Like I said, I wasn't there. I don't know exactly how they built it, but if it's similar to this photo that we have at the time of the incident, then two screws at that butt joint would be appropriate. You've only got so much wood, and you can't put too many screws in a concentrated location too close to the edge where you're going to split, and it would be worthless anyway. So you need to follow good construction practices.

Q. When we were talking about screws, tell me what -- tell me what withdrawal strength is.

A. Withdrawal strength is the strength developed between the wood grain and the threads of the screw. So there's going to be two types of forces, either shear or withdrawal; shear being perpendicular to the fastener, and then withdrawal being a tensile load that you apply to the fastener.

Q. Pulling out?

A. To pull it out, correct. Exactly.

Q. Have you done any calculations to determine the withdrawal strength of the screws that were used at the 77th Avenue North walkover at the time of Mr. Ciampanella's incident?

A. No, because it would be irrelevant. This was a corrosion failure. There was no evidence that the fasteners failed in withdrawal. Well, I'll take that back. I guess you could say that the -- there's two separate rails here. There's a side rail and a cap rail. A side rail probably being the vertical rail, and the cap rail being the horizontal rail. And there is evidence that the cap rail did fail in withdrawal because the end of the fastener is still visible.

Q. All right.

A. No, I take that back. Let me look. We

might want to -- you might want to zoom in because I think that's -- I think that's a pure corrosion failure as well. Yeah, let me -- it looks like it's neck down. Let me look at that on the -- in the digital file.

I think it's neck down and corroded entirely through.

Q. And just tell us, what screw are you referring to? Like, where is it --

A. This would be what I was talking about, is there's a vertical rail.

Q. That's the post, what I call the --

A. Well, no. There's a post. It's a two-piece rail.

Q. Oh, I see.

A. Two two-by-fours, and I'm calling that the cap rail because it's on top and horizontal.

Q. Okay. You're talking about the rail that's on its side?

A. Correct, right. So it's the one --

Q. Vertical?

A. -- oriented horizontally as opposed to vertically.

And there's a close-up of that screw.

Q. But this rail is the one you call the cap

rail?

A. Correct, yeah. And that's the one we're getting ready to look at.

All right. So what I'm looking at, I'm looking at a zoomed-in view of that fastener. To me that is not withdrawal. That's just pure corrosion. And maybe, if you wanted to debate it, it would be a combination of corrosion and withdrawal.

Q. Okay. All right. Why do you say that? Why would it be a combination withdrawal, slash, corrosion failure?

A. All right. So there a little more clearer -- because part of the shank of the fastener would have been in the wood, but also there would have been the head. This was probably put in at an angle. It looks like it probably angles -- let's look at the photo. It looks like it probably angles in from the side. So if I'm looking at the photo, this being the flat two-by-four, it looks like the fastener was probably put in from the side, going in that way.

Do you follow me?

So the head would have been extended out probably another three quarters of an inch or so,

and the shank of the fastener corroded, which caused it to separate, and then it pulled out from the wood. So it's a combination of corrosion, fastener failure, and withdrawal because there's nothing -- essentially nothing left.

Q. Oh, I see. You're saying it pulled out from this area?

A. Correct.

Q. From the corroded --

A. Correct, yeah. Because that would have been in the rail piece itself.

Q. Would that -- was -- this would have been the head end of the screw?

A. Correct.

Well, I mean, the debate is -- and Mr. Hanna and I were debating that, too. I mean, is it possible that this was like a seven-inch screw that came in from the other side? I mean, I don't think you can develop enough torque to get that screw all the way through if it were, like, seven inches long because it would torque off, or you would have to predrill it. I think it's coming in from the side, and that's just what's left after the head corroded away.

Q. All right. But you believe that the failure

here was because of the screw corrosion; is that what I'm understanding?

A. This is all definitely corrosion related, yes.

Q. Okay.

A. You've got corrosion. You've got a reduction of the diameter. You've got loss of the head. And you're going to have volumetric expansion which causes the wood to expand and --

Q. When you say "loss of the head", is that loss --

A. The head of the screw.

Q. That came off as a result of the corrosion?

A. Correct.

Q. Okay.

A. Yes.

Q. And the corrosion here that caused the screw to break essentially, that's inside the wood?

A. Well, it's both inside and outside. As I said, if you were to look, you would be able to see that the heads are corroded, which in turn would be an indication of the remaining concealed section of the fastener also having some degree of corrosion.

Q. Show me, if you would, like, this head that you're talking about.

And while you're looking, wouldn't you expect, when you've got screws that are -- that are in the elements, especially at the beach, to show over time some measure of wear and tear --

A. Sure.

Q. -- or corrosion?

A. Exactly.

So, yeah, let's go -- here's a -- so here's a photo with that -- with the vertical section of the rail down.

Q. Okay.

A. All right. So I'm going to zoom in. All right. So if I zoom in -- you want to look this way?

Q. We're all behind you.

A. I should have just had these put up on the big screen. We can do that if we want to.

All right. So here's the actual photo. All right. So I'm going to zoom in, and you can see there's one of the fastener heads right there, which looks quite brown to me, an indication of corrosion of the head, which in turn would be corrosion of the concealed part of the fastener.

Q. Does the corrosion always start from the outside and work itself in or can you have

corrosion -- like if the wood is wet, for instance, can you have corrosion that begins on the inside of the -- on the interior part of the screw?

A. Oh, absolutely. I mean, we see that quite often, that you'll see if you have corrosion on the outside, there's a good chance you can have even more corrosion on the inside because it's in direct contact with wood, with moisture. Also some of the dissimilar materials that don't get along with each other in the presence of moisture, you get the galvanic corrosion because of the copper in the wood itself.

Q. All right. But the corrosion or the brownish color of the head of the screw that is exposed, that's not unusual; in fact, you would expect to see that at a beach walkover?

A. Sure, absolutely. Yeah, any type of fastener like that that's exposed, you're going to have corrosion within a given period of time.

Q. Okay.

A. And everybody knows that, which goes back to maintenance issues of properly inspecting, properly maintaining, properly repairing.

Q. Okay. All right. But going back to my questions about the withdrawal strength of a

three-inch galvanized screw that is either a number 10 or a number 12, have you done any calculations to determine the withdrawal strength of either of those types of screws?

A. I have not.

Q. Okay. So when the walkover was built, if it was built with three-inch galvanized screws, two three-inch galvanized screws, let's say like it was in this instance, do you agree then that --

A. Well, let's go back.

Q. -- at the time of construction it would have withstood 200 pounds of concentrated force?

A. Yeah, let me clarify that first and then I'll answer your question.

It looks like there were probably two on the face. I'm only seeing one on the cap rail. It looks like they probably -- they may have had the two rails interconnected with each other. But two into the post from the vertical rail, and then one from the side into the horizontal rail. So probably three screws attached to the post.

Q. Okay.

A. The question is: Would that withstand a 200-pound force?

Q. But the railing that dropped is the vertical

railing?

A. Well, it looks like they both dropped because the other one is laying on the ground.

Q. Okay. All right.

A. It looks like -- see, it's a two-piece design, right? You've got a vertical and a horizontal. And it looks like the horizontal dropped and it looks like -- I mean, it looks like the vertical section dropped on one end, and it looks like the horizontal section completely fell out and is laying on the ground.

Q. Okay. The vertical board has, you believe, two screws --

A. Correct.

Q. -- into the post, and you believe the horizontal board, which you call the cap -- capstone?

A. Cap rail.

Q. Cap rail?

A. Cap rail, yeah.

Q. -- you think has one screw into the post and then another screw into the vertical board?

A. Well, let's zoom in and look at the vertical. Actually I'm not seeing any -- I don't see any additional screws that would have gone

through the vertical.

Q. What are you --

A. I mean, if it were attached, the screws would have went through this vertical rail into the horizontal because it would have been at a right angle to each other. So if there were an additional screw --

Q. But the railing is -- it's on the ground.

A. No, but the rail would still -- well, I mean, it could. It could have gone through the top down.

Q. Right.

A. Which is unusual because generally as a carpenter has an opportunity to make it a pure straight face attachment as opposed to going at an angle, generally he's going to go straight in. So I see no evidence that there was another fastener that went through the vertical section into the horizontal.

Do you follow me?

Q. I guess.

A. I can draw it if you want me to.

Q. If that's where the screw would have been.

A. Well, most likely. I mean, a guy could tell you, yeah, I could run it through the top, but that

would be unusual, because, one, it kind of splits the grain, and, two, there's a risk it will come out the side. So generally if you can run it straight through the face, it's a lot easier and safer and a better connection.

If you want me to draw it I can, or show you what I'm talking about.

Q. Do you know how many screws were in the horizontal board connecting it to -- fastening it to the post?

A. One.

Q. Only one?

A. That's all we see.

Q. Okay.

A. That's all we see evidence of. One. Right there. One.

I can go to the close-up view. Oh, there it is right there; one. Two from the side and then one kind of toe-fastened through the horizontal section.

Q. Two from the side and one...

A. Yeah, that's this piece going --

Q. A toenail?

A. Yeah, exactly. A toe screw, yeah, exactly.

Q. Okay. Let's see. All right. You have not

done any calculations to determine the withdrawal strength at the time of construction?

A. No.

Q. Okay. Mr. Campbell, are you able to say at the time of construction that the railing at the 77th Avenue North walkover would not have withstood 200 pounds of concentrated force?

A. I don't know exactly how it was constructed. I mean, we could -- if we made the assumption that this was the as-built condition, I'd say it's going to be marginal, but I can't tell you. There's a possibility it could meet the 200-pound rail requirement.

Q. You don't have enough information to say that at the time of construction it failed to meet the 200-pound concentrated force requirement?

A. Correct.

Q. Okay.

A. Because we don't know how it was built --

Q. Okay.

A. -- at the time of construction.

Just while I'm looking here, just to confirm what we're talking about, this is probably an angled -- a toe screw. That's the way it's done on the other side, too. See, it comes through the

side?

Q. And you said that's sort of the recommended approach?

A. Well, that's the way you would do it. You try not to put the fasteners exposed on the top surface. You want them on the side or under the bottom, if you can. And that's the way they did the other side. As you can see also, that causes the wood to split, which is a problem. That's why I was talking about if you put too many screws, or even a number 14, it definitely would have split.

Q. So you want a nice, sturdy screw, but not too sturdy?

A. Exactly, yep. And not too many and not too close to the edge.

Q. Is a 10 or 12 an appropriate size screw?

A. It would be.

Q. Okay.

A. Yes.

14 is kind of pushing it.

Q. Are there too many screws that were used in this construction?

A. No. I mean -- well, I mean, that one -- let me look again. That one might be a little close to the edge because it is starting to split. That one

-- yes, that's a good indication, too. See, the wood is splitting, and there's definitely evidence of corrosion, and that splitting may be because the screw was expanding because as you get corrosion product, it swells, and it can cause the wood to split, and there's an indication there's a potential moisture problem there.

Q. Okay. We're looking at the opposite side --

A. Opposite side.

Q. -- of the walkover, correct?

A. Correct, yes.

Q. In this photograph?

A. Correct.

Q. But talking about the number of screws in this particular section of the walkover that -- where Mr. Ciampanella fell, were there an appropriate number of screws used at that junction?

A. Yeah. It may not have met the full 200, but as far as somebody just simply walking, leaning under normal everyday activities, it would have been appropriate.

Q. Okay.

A. Except for the advanced state of corrosion, which greatly weakened the rail. I mean, just to kind of put it in a perspective for you, to reach a

200-pound load, which is the code, the rail must be designed and constructed to withstand a 200-pound concentrated load at any point in any direction unless it's an impact load or somebody literally running into to it and hitting it. To reach a 200-pound load you would have to have a 200-pound person standing on it at that location.

Q. What about a 200-plus pound person sitting on it?

A. Yeah.

Q. Would that exert --

A. If he's over 200 pounds and sitting on it.

Q. That would exert more --

A. Right.

Q. -- than 200 pounds of concentrated force?

A. Correct, it would.

Q. Have you considered that option or that possibility in this scenario, whether or not Mr. Ciampanella could have been perhaps sitting on the railing, and his weight exceeded 200 pounds of concentrated force, and the railing at that point gave way? Have you considered that option?

A. If I'm not mistaken, it's my understanding that he did not weigh over 200 pounds.

Q. Okay.

A. Unless I've gotten -- unless I've gotten confused on my information. But these failures are not withdrawal failures except for the little bit of withdrawal that we have on this horizontal piece. The other two failures appear to be just pure corrosion-type failure of the fasteners. So -- but, I mean, hypothetically, if he weighed over 200 pounds, and he sat on that end at that location, I mean, it would exceed the load capacity of the rail.

Q. Okay. But as it existed, if I understood correctly, it may not have stood up to 200 pounds of concentrated force, but as it existed on August 19, 2014, it would have handled ordinary everyday traffic okay?

A. If it were recently constructed and the fasteners were not corroded. That was my point. If it were built that way to begin with, with the two intersecting rails, three screws, and the screws were properly maintained, then, yeah, it would have easily withstood normal everyday activities. Now, would it have withstood a 200-pound person sitting on it, that's -- it's getting in that marginal range with three fasteners.

Q. There's no requirement that the city has to build or maintain a guardrail or handrail that is going to withstand more than 200 pounds of concentrated force, is there?

A. It depends.

And truly, we've had this debate internally because there's a section in the building code that says if the building official is concerned about the structural capacity of a connection, it must be tested to a factor of safety. I think the number is 2.5. So a factor of safety of 2.5 means that a 200-pound connection has to actually withstand 500 pounds. And these connections should have a factor of safety anyway, because you never design a connection or building or a component to fail at the required load. You always have to have some factor of safety, generally at least a 1.5 factor of safety. So if there's a 200-pound required load or load capacity, then you probably should have at least a 300-pound connection. I mean, any engineer will tell you, you've got to have a factor of safety or you're definitely living on the edge.

Q. But if you're -- like, if you are relying on the International Building Code provision that says 200 pounds of concentrated force, that provision

just says 200 pounds of concentrated force; that's what the building code requires?

A. Yeah, that part -- that section of the code is silent on any factor of safety, but it also says -- it does gives you some guidance that if you're concerned about a connection, you've got to have a factor of safety of 2.5 when you test it.

Q. How many screws do you need to provide 500 pounds?

A. We actually -- and we've been doing a lot of rail testing. It has nothing to do with this case, but based on some of our other cases, we had a pre-manufactured rail that you could buy from Lowe's, and we ran a -- I think a number 14 screw, a single number 14 screw through the top of it, and I think we got 600 pounds. So that would be real close to your 500-pound capacity.

Q. You used a 14 screw?

A. Through the top.

Q. That's okay?

A. Well --

Q. I thought that was too big.

A. Well, it can be too big. I mean, we were just testing just the connection just to see -- we would not construct it that way, but if you're

going to, if you want to put a large screw through the top of it to see what would happen -- and that was a different rail section than one of these two-by-fours, but another prefabricated rail section you can buy off the shelf from Lowe's, if you run a number 14 screw through the top -- I'd have to verify that, but I'm pretty sure that's what we did.

Q. Have you done any testing to -- using, like, the expected construction standards, using a number 10 or a 12 screw, to determine how many screws, what configuration, would provide 2.5 -- 500 or 600 pounds of protection?

A. Right.

Q. Have you done --

A. I would have to check. John and one of the interns is doing that testing. I would have to check their results. I'm pretty sure their results were all over 200 pounds. I'm not sure how far over 200 pounds they got. And that was using some screws through the side like this, angled fasteners, toe fasteners.

Q. Like the way that it was done by the city?

A. Correct, yes.

Q. And they got --

A. Over 200.

Q. -- 200 pounds of concentrated force?

A. Correct, yeah.

And the bottom line is that those are fine on day one, but what happens when they corrode? The problem we have quite often with these failures is that they do corrode and they're in the -- what we call the run-to-fail mode because they're out there; nobody inspects them; nobody maintains them, and they're neglected, especially in an abrasive, highly corrosive environment. That's the problem that we have. The same issue with Mr. Connell's recent case.

Q. Have you or has your office done any similar testing in connection with this case to determine what it would take to withstand 200 pounds of concentrated force?

A. No, sir, none at all.

I'm going to take five while you're looking at your notes, before we go back on.

MR. BRYAN: Yes, sure.

(A recess transpired from 12:14 p.m. until 12:18 p.m.)

BY MR. BRYAN:

Q. Mr. Campbell, what evidence is there that

the walkover and railing were not built in compliance with the applicable building code or industry standard at the time of original construction?

A. Well, as we said, I'm not sure that we have evidence that it was not built properly because we don't know exactly how it was built. We don't know the day it was built. We don't know how it was built. We don't know the fasteners that were used. But we do know that at the time of the incident, there was a walkover; there were rails, and the rail failed as a result of Mr. Ciampanella simply leaning against the rail. There's no evidence that he sat on the rail. There is an incident report that he leaned against the rail. I don't think there was any drinking involved, and I don't think he's a large person. But there's no testimony that he was sitting on the rail, that I'm aware of.

So it's a -- to kind of get back on that point, it's a maintenance issue as opposed to an original construction issue.

Q. Okay.

A. And, I mean, if we want to look at it somewhat from a biomechanic standpoint -- this is a little bit hypothetical, but if he were sitting and

dropped straight down, most likely he would have also probably hit the lower rail. But we don't know what happened, so I'll just say that to me, from what I understand, there's no testimony or evidence that he was sitting on the rail. But there is also evidence that it was not maintained properly, because we do have clear evidence of excessive corrosion. I think that's the bottom line.

If we go back to these standards and guidelines, the standards and guidelines do not recommend number 10 or number 12 screws. They're showing a through bolt, or I think you could easily substitute a lag bolt, which would, one, be much stronger, much larger, have a much longer life expectancy, and be much more corrosion resistant, which is why the guidelines are developed based on more of a bolted fastener as opposed to a small diameter wood screw.

Q. Mr. Campbell, can you say when the railing -- at what point the railing would no longer withstand 200 pounds of concentrated force?

A. I can't put an accurate timeline on it. Was it 12 months prior to this time? 24? 36? I don't know. I mean, if we had access to it and we

analyzed it and we examined it, we did some testing, some analysis and calculations, I think we could probably come up fairly close, but just kind of backing into it from these photographs, there's going to be a lot of assumptions or would require a lot of assumptions.

Q. If you were to try to do it, what would you do?

A. I would need to determine the size of the fasteners. I would probably also reconstruct an exemplar and load test it to see at what point it failed. And then I would also probably get a metallurgic engineer involved to help develop a timeline of the rate of corrosion, and that would give us information on the original strength. Clearly it failed. It was probably near minimal load-carrying capacity at the time of the incident. And then plot that in between regarding corrosion, fastener strength, connection failure, all of those components. So it's going to require a lot of assumptions.

Q. Then that would give you an approximate time when the railing would no longer withstand 200 pounds of --

A. Right. We start from the max. We end up

probably near zero, and we've got to kind of calculate all points in between.

Q. Okay. But that can be done?

A. I think it could be done, sure.

Q. Okay.

A. Well, I don't know. I mean, if we know -- if we go back to maybe one of the other rail sections, if it's still there, what -- the type of screws they used, if they used a number eight or a number ten, a three-inch galvanized wood screw, we can make some fairly reasonable assumptions based on that.

Q. Okay. Has any of that work been done, the testing, any experiment been done, the types that you just described?

A. No, sir.

Q. Okay.

A. As I said, I'm not sure that's justified since we're looking primarily at a corrosion failure and a maintenance issue as opposed to original construction and original strength and some nominal strength at a given time prior to the incident. Unfortunately, it's just bad construction and inadequate maintenance.

Q. Well, I didn't think you had an opinion

about the construction. Like, you don't know how it was constructed.

A. Well, based on this. We know how it was constructed at the time of the incident, and that's not ideal, using small diameter fasteners in an abrasive corrosive environment, unless you maintain them on a regular basis. But at some point in time, you're not going to be able to get those fasteners out, so you're going to have to replace the post and the rail because you're going to start just chewing up the wood, have excessive splitting, and there's no way to repair it, unless you go with some type of a bracketed connection, which is not uncommon either.

Q. In your affidavit, the code violation or the code compliance issue that you raise there is the 200 pounds of concentrated force requirement --

A. Correct.

Q. -- not being met?

A. Correct.

Q. And at the time of construction, you're not able to say it would not have met that 200 pounds of concentrated force, correct?

A. Yeah. I can tell you it's going to be close, but, I mean, the code requires a 200-pound

concentrated load at any point. I don't think you're going to get -- on that cap rail with a single fastener, I don't think you'll get 200 pounds out of that. Now, if they had been fastened together so that they worked integrally as a system or an assembly, with three fasteners you might get 200 pounds, but it looks like this cap rail was -- would have been functioning independently of the vertical rail. I don't think you'll get 200 pounds out of that single fastener.

Q. But you haven't done any calculations to determine how much strength you get from, let's say, a 10-inch -- or a number 10 or number 12 screw with one and a half inches of penetration?

A. No, sir.

Q. Okay.

A. But I'll say, based on your questioning and just for our own information, we may do some testing.

Q. Okay. There is data out there that tells you how much strength you get --

A. Oh, yeah.

Q. -- per one-inch penetration, per inch and a half?

A. If we're talking about a withdrawal. I

mean, you'd check the two values. You'd check the withdrawal of the fastener and you'd check the shear strength of the fastener. And there are tables that give you guidelines on that.

Q. Okay. But at the time that you prepared your affidavit, you hadn't considered any calculations to determine the strength of the number 10 or number 12 at one and a half inches of penetration?

A. No, because it was irrelevant.

Q. Okay.

A. What we're talking about is a corrosion-related failure of fasteners that were not properly maintained.

Q. Well, in your affidavit you talk about it was built out of compliance. And so if we're talking about the way it was built, then I think it is relevant.

A. I think what I said -- I grouped everything together; designed, constructed and maintained. I think those are terms in a series there.

Q. There's construction and maintenance.

A. Right, exactly.

Q. Now I'm just talking about construction.

A. Right.

Q. And I've ask you a number of questions about what you know about the original construction.

A. Well, if we want to go back to construction, as I said, the industry standard, I believe, and what would be good construction practices, would be to follow the industry guidelines. We have guidelines from the industry. We have guidelines from DHEC. We have guidelines from the Coastal Council. We have guidelines from the Coastal Construction Manual, which is essentially a FEMA document, all showing recommended practices using bolts as opposed to small diameter wood screws.

Q. Okay. Do you know --

A. That's my point.

Q. -- if those standards were in place -- like, if you don't know the time of the original construction, then how can you say that those -- do you know that those standards that you've just referred to were in place at the time of the original construction?

A. Well, I think the -- I think we've got the Coastal Construction Manual going back into the '70s and '80s.

Q. Have you looked at that to see what it says about construction of walkovers?

A. Yeah, they have the same basic guidelines and details.

The big question is -- I mean, if you're going to tell me that this went back to the -- this walkover went back to the '70s and '80s, then we might need to back up a little bit. I would be surprised if it had been there that long, using these same materials, in that condition, because I don't think you would have been able to put enough fasteners through those rails over a 40-year period and continue to use them. I mean, maybe so. I think that would be a stretch.

Q. And they could replace posts; they could replace wood, right?

A. Yeah.

And it goes back to -- if we want to expand on my opinions, as I was going through this, even the City of Myrtle Beach -- maybe they can find it, but they could not tell you, I don't think, from their depositions, the original date of construction. What most entities usually do, one, they've got a file, they've got permits, and they have an asset list, because you need to track your assets. So if you've got an asset list, there should be an asset list of these walkovers showing

date of construction, and maybe they just didn't check deep enough, but --

Q. All right.

A. -- you'd like to have an asset list that gives us that information, and then we would all be a lot better informed.

Q. All right. But in formulating your opinions in your affidavit, there is mention that the walkover was not built, was not constructed, in compliance with the building code requiring 200 pounds of concentrated force, requiring it to withstand 200 pounds of concentrated force?

A. Well, I mean, if you want to break out those terms separately, I mean, we can go back and look at the verbiage, but I think I had this all in series, designed, constructed and maintained.

Q. All right.

A. I don't think I had a separate statement that said only construction.

Q. No, I think it was construct and maintained.

A. Yeah. And to me they're all --

Q. I was just speaking about to construction first --

A. Yes.

Q. -- and then I'll talk to you about

maintenance.

A. To me they're all interrelated, and that was the intent of the way that was worded.

Q. Let's see here.

MR. BRYAN: Madam Court Reporter, if you'll mark that as our next exhibit.

(EXHIBIT 4, Affidavit of Alan O. Campbell, was marked for identification.)

BY MR. BRYAN:

Q. Mr. Campbell, I was just looking at the first bullet point under paragraph four at the bottom of the first page, and it carries over to the top of the second page. I was starting there.

A. Right. Built and maintained.

Q. All right. Well, let's talk about building it. Like, do you have any evidence that the walkover and the railing were not built in compliance with building code and industry standards at the time of original construction?

A. I haven't done those calculations, as I said. I'm going to be surprised if that single fastener connection is going to withstand 200-pound loads.

Q. Okay.

A. A 200-pound load.

Q. All right. Okay. And then, Mr. Campbell, what is -- can you point me to the document that states how the city should maintain the walkover?

A. I'm not sure there's an actual document out there that says "you shall". I think it's more along the lines of good construction practices. And our experience has been over the years that inspections should be performed a minimum once a year and ideally twice a year. Three years is entirely too long. And the reason being is that rule of thumb is that you would check it every six months prior to peak season, which would be sometime in probably March/April time frame, and then you check at the end of peak season, which would be after the tourists have left and after any substantial storms have gone through. So you've only got March/April time frame and probably maybe the October/November time frame; prior to peak season, end of peak season. You've got -- that's your peak storm season; that's your peak usage time with tourists and guests and usage. And then you've got any storms such as tornadoes, hurricanes, rain; rain, wind, heat, whatever it may be. That's -- the summer months are going to be

times of peak corrosion as well because of the temperature, humidity and rainfall. Three years is entirely too long.

Q. All right. But tell me the industry standard that provides for that inspection and maintenance schedule for a beach walkover, if there is one.

A. The document we've used -- I'm not even sure if I still have a copy of it -- is the Means Construction -- no. I think it's the Means, and that's a -- kind of a corporation that puts together a lot of construction-related documents. I think it's the Means Facility Maintenance Manual, which addresses what I just said, twice a year inspections. And that would be rule of thumb. There is no mandate or no absolute requirement that says "you shall", but certainly you should follow good industry practices and industry standards.

Q. And do you have a copy of the Means Facility Maintenance Manual in your file?

A. I would have to dig it up. It's certainly not in my file. It may be in our library.

Q. Is it fair to say that's not something you considered when you were drafting your affidavit earlier this year, is it?

A. Sure it is. Because it would have been the part that addresses improper maintenance.

Q. Okay. Can you identify the section within the Means Facility Maintenance Manual that you relied upon?

A. No.

Q. Do you have access to it today?

A. I'd have to dig it up. It's probably somewhere in our library, but I don't know where it went. And there are other documents that are similar. And I can't tell you I can put my hands on it. It's something we've had over the years, and that's our rule of thumb.

Q. Can you identify any other cases in which you've testified that an inspection schedule for beach walkovers should be before peak season and after peak season?

A. I don't think my deposition has ever been taken in one of those cases.

Q. If we take a break, can you get the Means Facility Maintenance Manual and identify the provision that you relied upon?

A. I will have to go back and check our library and see if it's back there.

MR. BRYAN: Let's take a break and do

that.

(A recess transpired from 12:38 p.m. until 12:42 p.m.)

BY MR. BRYAN:

Q. I don't know, Mr. Campbell, if you want to --

A. Yeah. I do not have that manual. Either somebody has borrowed it, I've loaned it out, somebody has put it somewhere else. I'll just have to see what I can find.

MR. CONNELL: I'm going to e-mail you those 13 pictures, Will.

MR. BRYAN: Okay.

MR. CONNELL: I'm going to send them to you.

BY MR. BRYAN:

Q. What do you believe the Means Facility Maintenance Manual says with respect to inspecting or maintaining the walkover?

A. It doesn't specifically address walkovers, that I remember. It says when you inspect your facilities, follow the schedule that I gave you. Ideally, inspect your facilities twice a year, as previously testified.

Q. Okay. Can you identify a provision within

the International Property Maintenance Code that provides the standard by which the city should inspect or maintain the walkover at 77th Avenue North?

A. Section 304, 304.1: The exterior of a structure shall be maintained in good repair, structurally sound and sanitary so as not to pose a threat to the public health, safety or welfare.

The following conditions -- this is 304.1.1: The following conditions shall be determined as unsafe and shall be repaired or replaced to comply with the IBC.

Number 12 of that list: Exterior decks -- excuse me. Exterior stairs, decks, porches, balconies, and all similar appurtenances attached thereto, including guards and handrails.

Q. Okay.

A. I think it's very explicit.

Q. But it doesn't provide a schedule?

A. No.

Q. A specific schedule? Okay.

A. I mean, it's subjective. It's a performance requirement. It's not a prescriptive requirement. These codes have prescriptive requirements and they have performance requirements. So from a

performance requirement standpoint it says maintain it properly. That's up to the user; it's up to the owner; it's up to the contractor; it's up to the property manager. It's their responsibility to maintain it properly. And if they have not done that, they have failed. It's a performance requirement; not a prescriptive requirement. A prescriptive requirement would be 6 months, 12 months, 18 months. You can inspect it every month, every day or every year as long as you maintain it properly and safely.

Q. Mr. Campbell, how should the city or how could the city determine if the railings at its walkovers, and in this case at 77th Avenue North, if they would, in fact, withstand 200 pounds of concentrated force? How could the city test that to verify 200 pounds of concentrated force?

A. It could be very simple. They could apply a 200-pound concentrated load. They could have a cart with a stack of weights. I mean, if they want to do that, they could roll that cart out. And you don't have to have a 200-pound weight. You can stack them in 25-pound increments or 50-pound increments or whatever it may be. That would be the simple test. That's as about as simple and

easy as it gets.

Q. You're saying just tie a big old bag of rocks to the railing --

A. No.

Q. -- that weighs more than --

A. No, like barbell weights. You would roll them in a cart and set them -- and you don't have to test every rail. You would test a representative sample of a given rail and -- for example, on -- let's go back to this group of photos. For example, let's take one of these rail sections and start stacking weights on there, 25, 50, 75, 100, until you get to 200, and see if it fails or not.

Q. The flat --

A. Sure.

Q. The flat weights?

A. Just barbell disks. It would be a very simple way to do it.

And I'll tell you, I have not thought through that. You asked me the question; that's my first off-the-cuff answer.

Q. But there's no -- is there a -- is there a code requirement or industry standard that you could point to that actually says this is what the

city --

(The proceedings were interrupted.)

BY MR. BRYAN:

Q. I'm going to ask my question again. We got interrupted.

There's no industry standard or -- that actually states that this is how the city or any building owner is to test the strength of a railing to withstand 200 pounds of concentrated force? I mean, that's --

A. Well --

Q. The dumbbell disks, the barbell disks or any other method, that's not really -- that's not a standard that's stated in any literature, is it?

A. No, the code generally does not give means and methods. It gives a prescriptive requirement. Their prescriptive requirement is a 200-pound load. And generally they leave that up to the discretion of the engineer, the testing agency or subject to the approval of the building official. But there is a very specific section. I think it's either Chapter 16 or Chapter 17 -- we can dig it up if we need to -- that addresses what we discussed previously, the testing requirement to test those rails with a factor of safety of 2.5.

So it does tell you how much, what the factor of safety is, but it does not provide or require means and methods.

Q. All right. That's the code?

A. That is the code.

Q. Is there an industry standard that states this is how a building -- a landowner, in this case the City of Myrtle Beach, how they are to inspect and verify that its handrail will withstand 200 pounds of concentrated force?

A. Not that I'm aware of.

Q. Okay.

A. It just says the 200-pound concentrated load applied in any direction. The means and methods are going to be up to the tester or the owner or the testing agency, to the best of my knowledge. And there are testing agencies out there that will test those rails for you, so I'm sure they have their standardized procedures and protocols, but that doesn't necessarily mean that's the only acceptable procedure.

Q. You read the testimony of Mr. Anderson?

A. I did.

Q. And I think in his deposition he explained he goes through and he walks through and he pushes

on -- if you were there you could see him. He's pushing on --

A. Yeah.

Q. -- with his right hand, pushing with his left hand.

A. Right.

Q. Shaking them, shaking the railings, to test their, I guess, structural integrity.

Is that a -- is that an inappropriate way to determine whether or not an exterior structure is safe, like to comply with the section you mentioned earlier, the Section 304.1?

A. Just anecdotally I would say it's inappropriate because he did not identify that there was a compromised rail section. I mean, if he's going by and just pushing and bumping, he's probably going to exert maybe a 10-to-15-pound force on those railings.

Q. You don't know how much force he really is exerting, do you?

A. No, I'm just estimating if that's all he's doing is pushing and bumping. But that's my point. Anecdotally I'd say it's inappropriate because he did not identify a compromised rail section. This needs to be done visually. It needs to be done

physically. I think there should be probably -- if you're not going to look close enough to see if there's any corrosion, I think there probably should be a representative load test on a given walkway. You don't have to test the entire walkway, but take a representative section of one of those walkways and test it. And even a simple dumbbell test, barbell disk, it would take all of probably five or ten minutes once you roll your weights out there.

Q. How do you know, Mr. Campbell, that the railing at 77th Avenue North was compromised, let's say, in June of 2014, prior to Mr. Ciampanella's incident? Because I believe that's the approximate date of Mr. Anderson's inspection --

A. Right.

Q. -- if I recall correctly.

So how do you know at the time Mr. Anderson goes through there that he should have discovered something more?

A. I'll just say it's not impossible that the load-carrying capability of that rail would decrease dramatically in two and a half months, it's just not probable. Because when it failed, if he simply leaned against that rail, that would have

been a very minimal load. And for that rail to decrease in strength from say 100 pounds to 30 pounds in a two-and-a-half-month period, it would be highly unusual. So we need to talk about possibilities versus probabilities.

Q. But what happened when Mr. Ciampanella's incident occurred is that the interior of one of the screws, it corroded and broke?

A. Sheared.

Q. Sheared.

A. Right.

Q. But up until that point, it would have provided some measure of that screw -- other screws would have provided some measure of strength?

A. Sure. The analogy is the straw that broke the camel's back. I mean, it's good up until that last minimal increase in load to where it can no longer carry that load and it's a catastrophic failure. So if Mr. Anderson applied a 15-pound load, but it required 15.1 pounds to fail, that's all it takes.

Q. Can you tell me -- can you tell us when that -- when the screw that -- when the screw sheared?

A. Can I tell you when it sheared?

Q. Yes, sir.

A. No. I mean, it appears -- I mean, if I were going to speculate, which is what this would be, it appears -- and I'll look at this photo right here -- that probably the two fasteners on the vertical rail were probably failed or all but failed and simply in place, and the failure was actually withdrawal of the corroded toe fastener in the horizontal rail. Because there's nothing left over here. There's at least something left in the horizontal rail. In the vertical rail there's essentially nothing left. It appears any nominal load-carrying capability may have been in the horizontal rail and almost nothing in the vertical rail. The horizontal rail being the cap rail.

Q. Do we have a photograph that shows, I guess, the vertical rail?

A. We've got this one we can zoom in on.

Q. Well...

A. Oh, here you go. How about that?

Q. So do you have shear here as well of the vertical rail?

A. I don't think you have much of anything. Those fasteners are just gone.

Q. Do you have shear and withdrawal?

A. There's no evidence of any withdrawal

because there's nothing left.

Let me zoom in on that one.

Q. Is there not a -- there doesn't appear to be --

A. Is there a little bit of residual?

Q. -- a piece of the -- it looks like a spike --

A. We call it a residual.

Q. -- coming out of the post.

A. All right. We'll take a look.

Q. The photos we have here, these are yours? I'm asking because I was going to mark them.

A. Well, it came from Mr. Hanna.

Yeah, these are printouts for your use.

Q. All right.

MR. BRYAN: Let's mark it as the next exhibit.

(EXHIBIT 5, Colored photograph, was marked for identification.)

(EXHIBIT 6, Colored photograph, was marked for identification.)

THE WITNESS: Yeah, you're right. There's a little bit left on that bottom fastener, but it looks like the threads have pretty much corroded away and there's

nothing but the smooth shank left.

BY MR. BRYAN:

Q. All right. So we are -- the photograph we're looking at now is -- is that the one marked Exhibit 6?

A. Correct.

Q. Okay. And so that -- does that indicate to you that the vertical board, its failure was also shear -- corrosion and shear?

A. No, that would be withdrawal as well.

Q. Okay. Its failure was both caused by corrosion --

A. It looks like the head -- yeah, similar to the cap rail, the horizontal rail, it looks like the head of the fastener had corroded away through the shank, and there's nothing left but a little bit where it was embedded in the post. But the top of the head is gone, so it's corroded through the diameter of the screw itself.

Q. Well, if on Exhibit 6, if -- what do you call the pieces left in the --

A. I call it the shank.

Q. The shank.

A. I don't know if that's the same term on a screw, but on a nail or --

Q. Could you have the shear -- could you have a shear that leaves the shank, and then the vertical board separates from the post and the head of the screw is still --

A. No.

Q. -- embedded?

A. No. Shear would be the perpendicular force to the fastener at the intersection of two faces. So if it's sheared, then where the back of the board is butted up against the rail itself, shear would be shearing that fastener at that connection point. So what we have is withdrawal because it's not shearing.

Q. Okay. Well, it corroded and it broke?

A. Correct, yeah.

Q. And then when it broke, the vertical board pulls away, and we don't know -- I mean, the head of that screw may still be there?

A. It probably is in the board.

Q. Okay.

A. Yeah.

It looks like the top of the fastener is gone -- I mean, the top fastener is gone. If you look at the top, it looks like that's gone. So the only thing that's left is a little bit of the shank

of the bottom fastener.

Q. So the top screw withdrew?

A. I think it just totally corroded through. I don't think there's anything left.

Q. Now, on what basis do you say that, as opposed to the screw withdrawing with the vertical board?

A. It looks like it's still there. It looks like right there is the --

Q. You think it just --

A. -- embedded corroded residual fastener.

Q. You think it just broke --

A. Yeah, I think it's just gone, right.

Q. At the joint?

A. Exactly.

Now, technically that would be a shear --

Q. Yes.

A. -- if it failed at that connection point.

Q. Okay. And so the one side of the screw is with the vertical board, and you're saying the back end of that screw is still in the post?

A. Correct.

Q. But that would be the result of corrosion as well?

A. Correct.

Q. Okay. But that's -- again, that's going to be corrosion that occurs within -- inside the board and concealed to city employees, tourists, whoever?

A. Yeah. Other than what we see on the exposed face where the fastener goes through the board, correct.

Q. Okay. All right.

A. But as we saw from the other side in some of these other fasteners, there is evidence that those heads had gotten rusty and corroded.

Q. And that's not necessarily a -- that's not reason necessarily to sound the alarm or panic button, is it, because you're going to get that naturally?

A. Exactly. And the alarm would be on the asset schedule that they should have; how long have those fasteners been installed; how long have they been in the field. And if they don't know that, then they need to be doing more detailed examination and testing. Either you check the life expectancy and the exposure cycle in the field or you test it. Something has got to be done. You can't just put it on the run-to-fail mode.

Q. What if the city, the crew or the department

that handles the walkovers, what if they are all recurring on a continual basis, always addressing whatever deficiencies exist at the different walkovers; you need a new board here, you need a new post here, and they are -- whenever the need arises, they're putting in two new screws; that happens, let's say, on a daily basis throughout the beach at 70 walkovers --

A. I get your point. And they can do that, but clearly they missed it. And a three-year inspection cycle is totally inadequate. You've got small diameter fasteners, you've got a bad environment, and you've got a three-year inspection schedule; that is inadequate.

Q. Okay.

A. That's the bottom line.

Q. Your understanding is that the city utilizes a three-year inspection schedule?

A. Well, my understanding from testimony, yes. I understand they're also out there -- they're working, they're observing, they're using these areas on a regular basis, but from a conscious inspection cycle, three years.

Q. Okay.

A. Anything else is just kind of random, hey,

I've got a loose board; tack it back on or whatever.

Q. And your opinion that the city was negligent in maintaining the walkover and railing is because they utilize an inadequate inspection schedule of three years?

A. Yeah, along with the method of construction. If you had heavy-duty timbers and double hot-dipped galvanized or stainless bolts that takes ten years to fail, you might be able to get by on a two-or-three-year inspection schedule, but we don't.

Q. But I'm trying to look at the construction and the maintenance separately. Like, the construction of the walkover and the railing may have been adequate; it may have met -- it may have been code compliant, right?

A. They may have been, but I doubt it.

Q. What you're focusing on is the way it existed on the date of the incident?

A. Well, I'm also focusing on, as we said, the method of construction of a single fastener installed at an angle from the side on that cap rail. That's all we have, is just a single fastener; probably a single number -- maybe a

number 10 inserted from the side through that cap rail. I don't think that's going to give you 200 pounds.

Q. Do you know exactly how this failure occurred, whether or not the vertical board failed first and then the top board, the horizontal board, fell off without having the vertical board underneath it or do you have any reason to think that the top board came off first followed by the vertical board; do you know?

A. It's hard to say. I mean, he said he was leaning against it. One could have gone first or the other one. I mean, most likely the first point of contact, being the horizontal board, is going to be the first failure.

Q. Can you say that to a reasonable degree of engineering certainty?

A. No.

Q. Okay.

A. I don't think it matters. It failed. And they both failed, and they failed simultaneously and catastrophically. That's the bottom line.

Q. Let's see the exhibits.

Mr. Campbell, on Exhibit 6, are you able to say when the two screws in the vertical board

failed?

A. It appears the top screw was either substantially or totally corroded through at the time of the failure. It appears there was some remaining cross-sectional area of the lower fastener and it simply pulled through the wood, but there was also total failure of that fastener of the embedded section within the vertical board as well, because there's nothing left.

So, I mean, there is substantial corrosion or evidence of substantial corrosion on all fasteners, either entirely corroded through at one point or another, or such minimal area and thread of the screws that it had no capacity to hold those rails in place. And probably a little bit of all of the above, because if he simply leaned against it and it failed, he was not applying a significant force to it, so, therefore, it took a minimal force for both rails to fail simultaneously.

Q. Could it be that the screws here deteriorated to the point where they were not really staying together sometime prior to Mr. Ciampanella's incident, and then -- so they are now basically corroded --

A. Totally compromised.

Q. -- and then he leans against it sometime later, and that's when it separates?

A. It could be.

Q. Okay. I guess my question is: Can you identify when the fasteners, the screws, in this case, were totally compromised?

A. Not exactly, no. And what we know is that based on his testimony, it took minimal force for both rails to fail. So I mean, when we say totally compromised, maybe they had not detached, but they were essentially totally compromised sometime prior to his accident and probably at the time of the inspection by Mr. Anderson. Anything left, any part of those fasteners that was intact in June of 2014, it would have been very, very minimal.

Q. You're saying probably compromised at the time of Mr. Anderson's inspection. Like, what do you base your comment on?

A. Based on normal rates of corrosion and failure. As I said, it's possible that it corroded substantially over that two-and-a-half-month period from August -- I mean, from June to August, but not probable.

Q. Is it -- you also -- during the peak summer months you're also going to have more wear and tear

on it that's also going to accelerate the rate of degradation; is that true?

A. There could be more wear and tear, which goes back to a more conscientious inspection schedule.

Q. Okay. But --

A. Prior to and after peak season, not during the middle of peak season.

Q. But the screws that were fastening the boards at this junction, they may not have been compromised?

A. Oh, they were compromised. We just don't know was it 90 percent, 95 percent, 99 percent or 100 percent. They were definitely compromised.

Q. But can you say the degree to which they were compromised three months before -- maybe, whatever, two months before maybe, two months before Mr. Ciampanella's incident, considering the wind, the rain, the salt air, and increased activity during Myrtle Beach -- peak summer months in Myrtle Beach?

A. Based on rates of corrosion and those photographs, they were in substantially the same condition.

Q. If Mr. Anderson testified that he inspected

the 77th Avenue North walkover, and his inspection included walking down one side and shaking the railings, vigorously shaking the railings, do you have any reason not to believe Mr. Anderson's testimony?

A. Well, let's do this, because I think this is worthwhile. Because there are over 100 dune walkovers, and I think he inspects them all in maybe a three-or-four-day period, I think it's worth checking the number of walkovers, the total length, the number of rail sections, and divide that out, and I think we're going to probably find that he spent all of maybe 20 seconds on each section, a few seconds or whatever, but anyway, I can't tell you right now. I think it's worth looking at. I think it's worth breaking it down incrementally and from a unit standpoint as to how much time he dedicated to each walkover.

Q. So in your analysis, you're discounting Mr. Anderson's testimony?

A. No, no. I said I think it's worth checking so I can give you a more accurate answer. Let me just -- so if we've got -- and I'm doing this from memory, if you guys want to correct me.

I think he had three to four days. Let's give him

four days. That's 32 hours. 32 hours. Round numbers, 104 walkways. So it gives him 18 minutes per walkway. Let's take three minutes off for travel time, so let's say he does 15 minutes per walkway, divided by two because there's two sides. So we've got 15 minutes divided by two; that's seven and a half minutes per side, times 60 is 450 seconds. I don't know how many -- oh, wee, there's a lot of sections there. One, two, three, four, five, six, seven, eight, nine, ten -- I don't know. Say there's 15 sections each side. That's 30 seconds.

Q. What do you think he needs to do when he just shakes it? He needs to spend 30 seconds shaking it?

A. As I said before, it needs to be visual. It needs to be physical. There may be -- there needs to be some testing in between. So 30 seconds -- and there's two ends. So let's take that 30 seconds, divide it by two because there's two ends, so 15 seconds per end to shake it, examine it, and decide, and somewhere in between he's making notes, he's documenting, he's got to go back and record all of this information. I'm just -- this is a two-minute analysis. In a two-minute analysis

we've come down to about 15 seconds per connection. And on top of that -- let's go back. Let's divide that 15 seconds again because there's a top rail and a bottom rail. So we're going to divide by two again. Now we're down to seven and a half seconds per rail connection, top rail, bottom rail.

Q. Okay.

A. I mean, have your guy do the analysis and do the calculations, but just rough, quick and dirty, he's got between five and ten seconds per rail connection --

Q. Okay.

A. -- to both test it, shake it vigorously, walk, examine it, and take notes.

Q. Okay.

A. That's not much time.

Q. Okay. Earlier you said they should test a representative section of the railings --

A. I think so, absolutely.

Q. -- but in this case you're talking about -- you're tabbing Mr. Anderson not on a representative inspection, you're tabbing him based on inspection of every board, every joint?

A. He needs to check every joint.

Q. Except we're not talking -- now, based on

his inspection, it has to be -- it's not a representative?

A. The testing, the physical testing, would be a representative sample; check two or three; check two each side. But, yeah, if he -- based on his testimony -- I can go back and look at it again based on your question. I believe your question was: If he checked every rail, was that acceptable?

Q. Okay.

A. So if he checked every rail, just based on my quick and dirty calculations, he's five or ten seconds per connection.

Q. All right.

A. That's not very long --

Q. All right.

A. -- to visually and physically examine it and take notes.

Q. Okay. If he's doing -- if he's inspecting a representative section of the walkovers, is that adequate?

A. The answer to that is it depends. If it's in very good condition, and he checks a few and they're good, yeah, he doesn't probably need to check every one of them. But we know from this

maintenance schedule that we had -- and I'm just calling it that, that chart. It's not really a maintenance schedule. But this one was near the end of its useful life, for whatever reason, because it was going to be scheduled for replacement probably within the next 12 months. So we know this was one that's been here for a while. And we also know from these photos and the extent of corrosion and the failure that it's been there awhile because it was in bad condition. So one like that you need to spend more time on. One that's new doesn't require near as much time. Five seconds per connection is not very long.

Q. Is there an industry standard that says this is how long you should spend checking for the concentrated load requirement?

A. Whatever is adequate. As I said, it's -- if you can satisfactorily check it and maintain it properly and do it in a safe manner in accordance with industry standards, five seconds may be perfectly fine.

Q. But there's no --

A. Bottom line to me, he missed it. So it was not adequate.

Q. But there's no formula that says you need to

-- Tom Anderson or city employee you need to inspect it this way?

A. No. I mean, you've got the International Property Maintenance Code. It says you shall maintain it properly in a safe manner. The means and methods are up to you. You can satisfy that requirement in any way you see fit.

Q. If the railing at 77th Avenue North where Mr. Ciampanella fell, if that was substantially compromised in June of 2014, does it surprise you at all that no one visiting Myrtle Beach using that walkover during the summer of 2014 pushed through the railing until Mr. Ciampanella did?

A. Does it surprise me?

Q. Yeah.

A. What I've seen in my experience is that most people don't stop and lean on the rails. And usually when they do, most people will lean on a post. So -- and we have injuries and near-misses, and that's just kind of statistical data that's tracked sometimes. There's always thousands of near-misses, but how many accidents and injuries are there.

Q. Is that information that's relevant, though, that the fact that the railing was in use during

the peak season in Myrtle Beach and it did not fail until August 19 --

A. 2014.

Q. What is it?

A. 2014.

No, it's not relevant at all. What's relevant is that this walkway was maintained in an unsafe manner. It was unsafe. An injury occurred. I mean, you never know when you're going to go from the near-miss to the catastrophic failure. We see those conditions all the time on a regular basis.

Q. Okay.

A. And that's what happened. It was unsafe. It just, unfortunately, took Mr. Ciampanella to find it and identify the section that failed.

Q. Do you think someone performing that inspection, like Mr. Anderson was, that he should catch every potential accident that's going to happen?

A. I wouldn't term it -- I wouldn't evaluate it in terms of accident. I would evaluate it in terms of condition of the walkway. And as we said, if he did an adequate inspection, did some representative periodic load testing, he would have identified that this was a problem, which would have let him

know this walkway needs to be rebuilt. So I evaluate it in terms of the condition of the walkway, not the fact that we need to identify an area where an accident is going to occur.

Q. What should Mr. Anderson have done differently?

A. We've already been through that. He needed to test it adequately. He needed to pick a representative sample. And in areas where required, do some load testing or certainly evaluate those fasteners or replace those fasteners.

Q. But what is -- when you say "tested adequately", like, what do you mean by that?

A. Using some type of test apparatus. Either he brings a load of weights out there -- if he wants to sit on it himself; he thinks it's fine, go for it. But put some weights on it. Use some type of test apparatus. He could easily have some type of vehicle that pulls along parallel to this walkway with a dynamometer on it and do a load test. You can easily generate a load test at each connection in probably two or three minutes time.

Q. Okay.

A. So you can easily test this side in one of

their vehicles with a pulley mechanism on the back of a truck.

Q. Okay.

A. Pick two or three representative areas; test it and see what happens.

Q. All right.

A. I mean, there are numerous simple ways to test something that's at a level like this. When you get into an elevated rail on the side of a 15-story building, that's a whole different story. But if you're talking about something that's basically at chest height on the beach that's easily accessible, easy to test.

Q. Have you ever testified that that should be done?

A. None of our cases have required my depositions.

Q. Okay.

A. We get a lot of case like this, though.

Q. All right. But Mr. Anderson performed an inspection, based on his testimony, correct?

A. He did. Inadequately.

Q. It's your opinion that his inspection, at least at that area, was inadequate?

A. Correct. Well, that walkway was inadequate.

Q. What do you mean the walkway is inadequate? Are you commenting now on the entire walkover?

A. Well, if it was all representative of that condition, if all the fasteners had the same similar --

Q. Like, have you looked at the other sections?

A. No.

Q. Okay. So you're not commenting on that?

A. No.

Q. You're not offering that opinion? Okay.

Mr. Campbell, are there any other manuals that you can direct me to that provide a standard for maintenance of a walkover and railing besides the ones we've mentioned earlier?

A. Let's see what I've got here. This is one I have. This is not maintenance. This is just another detail for that walkway.

Let me see what this one has. This is a -- this is from the Coastal Construction Manual. It talks about maintaining the building. So if we want to put the walkway within the category of a building, then it says buildings should be inspected annually by professionals with the appropriate expertise.

Q. Mr. Campbell, in your affidavit you mention that -- well, first of all, you can't comment on somebody's state of mind, can you?

A. No, sir.

Q. Okay.

A. Not unless there's some testimony or evidence or analysis.

Q. Okay. In your affidavit you mention that there was conscious failure of city employees to construct the railing.

MR. CONNELL: What paragraph are you on?

MR. BRYAN: It's the bullet point on the second page. The bottom bullet point on the second page. It's a long paragraph. It's about five lines from the bottom, maybe.

Did we make the affidavit an exhibit?

THE WITNESS: We did.

BY MR. BRYAN:

Q. Okay. Do you have it?

A. No. I'll give Gene his back and pull it up right here. Okay.

Q. It's not your testimony that the city intended to violate building codes when they built

the walkover, are you?

A. No, I don't think it was any direct intent, no. It was an indirect failure due to their inadequate maintenance and inspection.

Q. Okay. Mr. Campbell, do you agree with me that for the summer of 2014, maybe some part of the spring, for that matter, when Myrtle Beach has tourists, through the time of Mr. Ciampanella's incident that that -- are you aware of any other failure of the walkover at the 77th Avenue North walkover?

A. No, sir.

Q. Whose deposition transcripts do you have besides Mr. Anderson?

A. Whoever those three -- I can give you the exact names, but whoever those three employees are.

Q. Okay. I can...

A. Do you want me to pull it up real quick?

MR. CONNELL: All of the ones I took.

MR. BRYAN: Yeah.

THE WITNESS: Yeah.

BY MR. BRYAN:

Q. When did you get those transcripts?

A. Probably just after we opened the job and before we did the subpoena -- I mean, before we did

the affidavit. I can give you the exact date, if you want.

Q. Yeah.

A. It's right here. Let me see when they came in. It looks like they were saved on our server on June the 2nd that we had them -- I guess we must have gotten them the day before.

Q. June 2nd, 2016?

A. Correct.

(A recess transpired from 1:36 p.m. until 1:47 p.m.)

BY MR. BRYAN:

Q. Mr. Campbell, we've talked about your opinions. I guess what I would like to know is, like, how you arrived at the opinions. Like, what did you do to arrive at your conclusion regarding construction and regarding maintenance?

A. Well, construction and maintenance are together because to maintain something generally requires some level of construction. It's not -- we're not painting. We're talking about fasteners; we're talking about wood; we're talking about repairs, which is going to require construction in order to perform those tasks.

So how did I arrive at my opinions? There

was a minimal nominal load, from testimony and from observations, a minimal nominal load applied to that rail, and the rail failed. It was not even capable of withstanding that. It certainty was not capable of withstanding anywhere near 200 pounds. It was not maintained properly, therefore, it was not repaired properly. So just the visual evidence alone tells me that they missed it. And it goes back to what we've already discussed and I've testified, there should have been an asset list; there should have been a schedule; there should have been a repair schedule; there should have been an adequate inspection schedule, and then there should have been adequate repairs or replacement performed on these rails and walkovers. They missed it. And sometimes the term we use is "repair by replacement". Either they need to repair it in place or they just need to replace it, period. They missed it, and it failed, and, unfortunately, Mr. Ciampanella was injured. That's the bottom line.

MR. BRYAN: Okay. All right. Thank you for your time.

(The witness, after having been advised of his right to read and sign this

transcript, does not waive that right.)

(The deposition concluded at 1:49 p.m.)

CERTIFICATE OF REPORTER

I, Lauren A. Balogh, Notary Public in and for the State of South Carolina, do hereby certify that the deponent, ALAN O. CAMPBELL, P.E., was duly sworn by me to testify to the truth, and that the above deposition, Pages 1 through 115, inclusive, was recorded stenographically by me and transcribed through computer-aided transcription by me to the best of my ability.

I FURTHER CERTIFY that the foregoing transcript is a true and correct transcript of the testimony given by the said witness at the time and place specified.

I FURTHER CERTIFY that I am neither attorney or counsel for, nor related to or employed by any of the parties to the action in which this deposition is taken, or financially interested in this action.

IN WITNESS WHEREOF, I have set my hand and seal this 8th of December, 2016.

Lauren A. Balogh
Notary Public
My commission expires
April 13, 2020

VERIFICATION OF DEPONENT

CASE: ***Ciampanella vs. City of Myrtle Beach***

I, ALAN O. CAMPBELL, P.E., have read the foregoing deposition consisting of 115 pages which was reported by Lauren A. Balogh, notary public in and for the State of South Carolina on November 30, 2016.

I find the transcript of this deposition to be a true and accurate transcript according to my testimony on that date with the exception of _____ corrections as listed on the attached correction sheet, which was filled in by me.

_____

ALAN O. CAMPBELL, P.E.

_____, 2016

ERRATA PAGE

PAGE #	LINE #	CHANGE AND/OR CORRECTION (AND EXPLANATION)

THE ABOVE CHANGES WERE NOTED BY ME ON THIS ERRATA PAGE BEFORE SIGNING THE ATTACHED VERIFICATION OF DEPONENT. I HAVE RETAINED A COPY OF THIS ERRATA PAGE FOR MY RECORDS, AND THE COURT REPORTER IS TO ATTACH THIS PAGE AND MY VERIFICATION TO THE ORIGINAL TRANSCRIPT.

DATED: _____ _____
ALAN O. CAMPBELL, P.E.

PLIED BUILDING SCIENCES INC.
ENGINEERS, ARCHITECTS AND ENVIRONMENTAL CONSULTANTS

Tuesday, August 9, 2016

Project Manager	Alan Campbell	***ABS Job No.***	981.16022

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City	Surfside Beach	***State***	SC	**Zip**	29587
Phone	843.238.5648				
Request Date	8/9/2016				
Case or File Number					
Client Project No.	2014-0324C				

JOB INFORMATION

Job Name/Description	Richard Ciampanella vs. City of Myrtle Beach
Job Site Address	boardwalk Myrtle Beach, SC
Job Type	Human Factors

Plaintiff	Richard Ciampanella
Defendant	City of Myrtle Beach
Third Parties	
Notes Tab	



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November 4, 2014

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Re: *Richard Ciampanella v. City of Myrtle Beach*
C/A No. 2014-CP-26-
Our File No. 2014-0324C

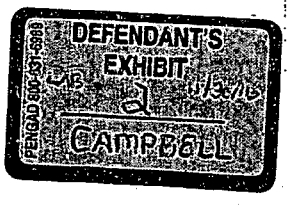
Dear Alan:

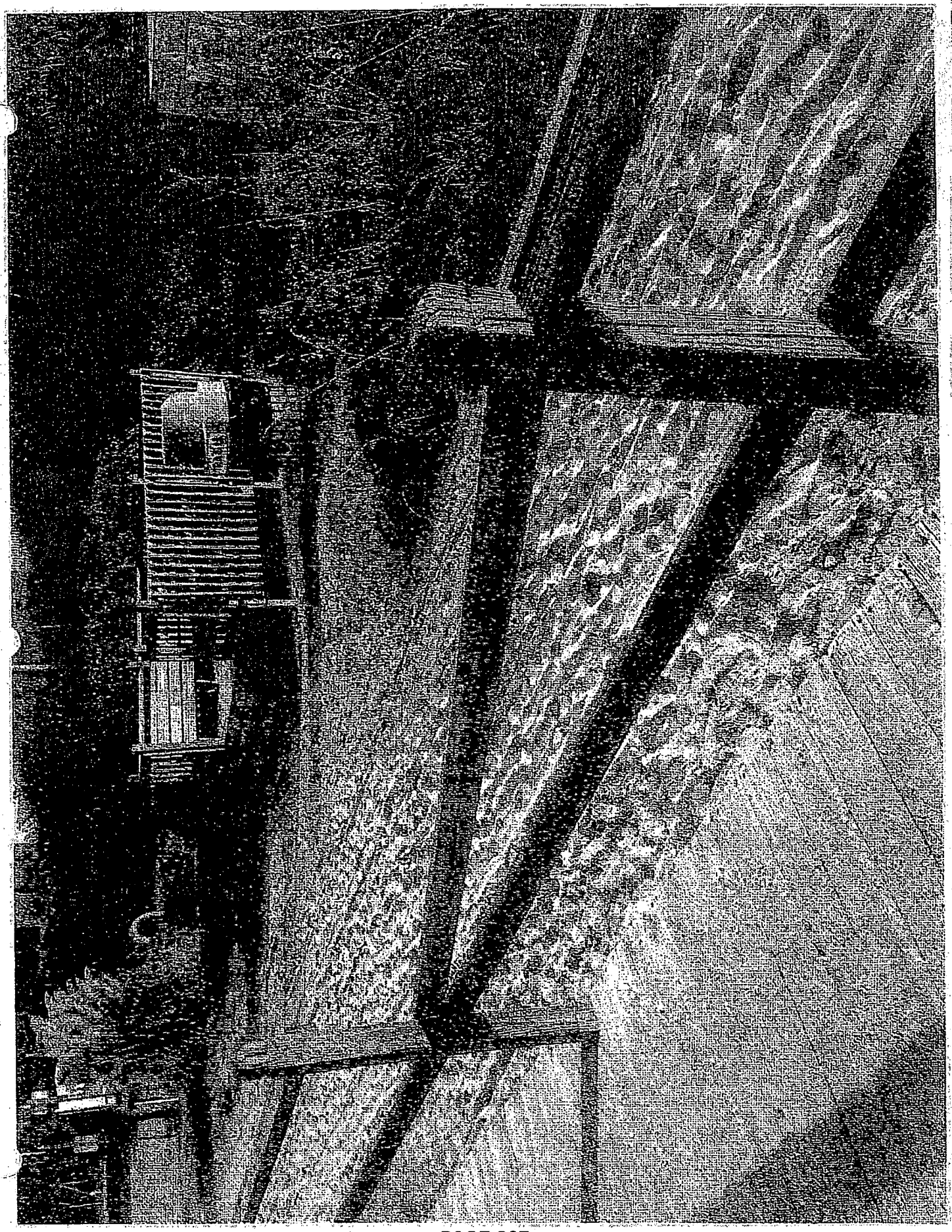
Attached are some photographs of a boardwalk area where my client fell when a railing gave way. Please let me know what your thoughts are.

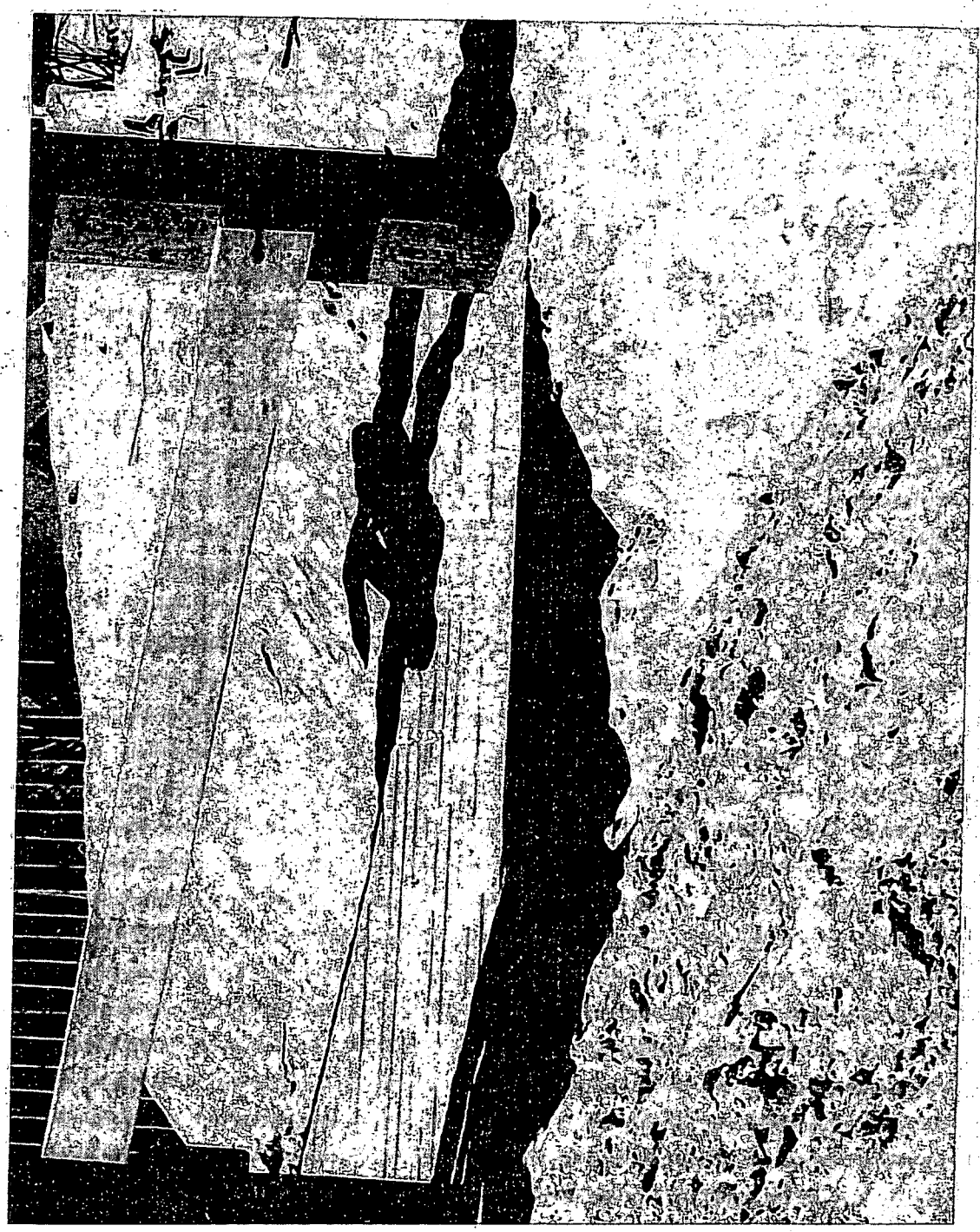
Sincerely yours,

Gene M. Connell, Jr.

GMC,Jr.:sm
Enclosures







STATE OF SOUTH CAROLINA **COUNTY OF HORRY**	**IN THE COURT OF COMMON PLEAS** **FIFTEENTH JUDICIAL CIRCUIT** **C/A NO. 2014-CP-26-7790**
Richard Ciampanella, Plaintiff, vs. City of Myrtle Beach, Defendant.	AFFIDAVIT OF ALAN O. CAMPBELL

PERSONALLY appeared before me, Alan O. Campbell, who first being duly sworn, deposes and states as follows:

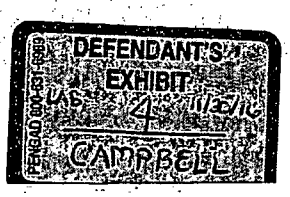
1. My name is Alan O. Campbell and I am a licensed professional engineer and life safety consultant responsible for accident investigations, building code interpretations, facility condition assessments and engineering investigations related to accidents, personal injuries and building code violations. I attach hereto a copy of my CV.

2. I have been qualified in the state and federal courts in South Carolina and in other states as a professional engineer and testified in numerous trials throughout this state.

3. I have been asked to review pictures of a beach walkover where the railing collapsed causing the Plaintiff to fall. I have reviewed a number of these cases in the past and I am well familiar with the building codes, regulations, and industry standards regarding beach walkovers.

4. After reviewing the photograph of the beach walkover access, the appropriate building code and the depositions of defendant's employees who did the maintenance on the beach walkovers, I have reached the following opinions:

- It is my opinion to a reasonable degree of engineering certainty that the railing on the beach walkover access over which the plaintiff fell was not built and maintained



according to the building code and industry standards which require that all railings must withstand a two hundred pound concentrated load when a person is leaning on them.

- It is further my opinion to a reasonable degree of engineering certainty that the City of Myrtle Beach, through its officers, agents and/or employees, acted negligently in building and/or constructing the walkover in violation of the applicable building code and industry standards, in failing to inspect the walkover to make sure they would sustain someone leaning on the railing and in failing to repair the railing on the walkover.

- It is further my opinion to a reasonable degree of engineering certainty that the failure to maintain and construct the walkover according to the applicable building code and industry standards is gross negligence. Building codes and industry standards are prepared as a minimum standard of safety and failure to abide by this minimum standard of safety is evidence of gross negligence. Further, failure to follow the applicable building code and industry standards in construction of the railing by the City is something that City employees would have known when they constructed and/or repaired the walkover and the railing. The photograph of the railing after the accident and of the detail by which the railing was built shows a conscious failure of City employees to construct the railing on the walkover in a workmanlike fashion. Those employees should have known that the applicable building code and industry standards require that all railings withstand a two hundred pound concentrated load and the failure of the City employees to build the railing constituted a significant hazard to the public by City employees who built

and/or constructed the railing and failed to build and maintain them according to applicable building codes and industry standards.

FURTHER AFFIANT SAYETH NOT.

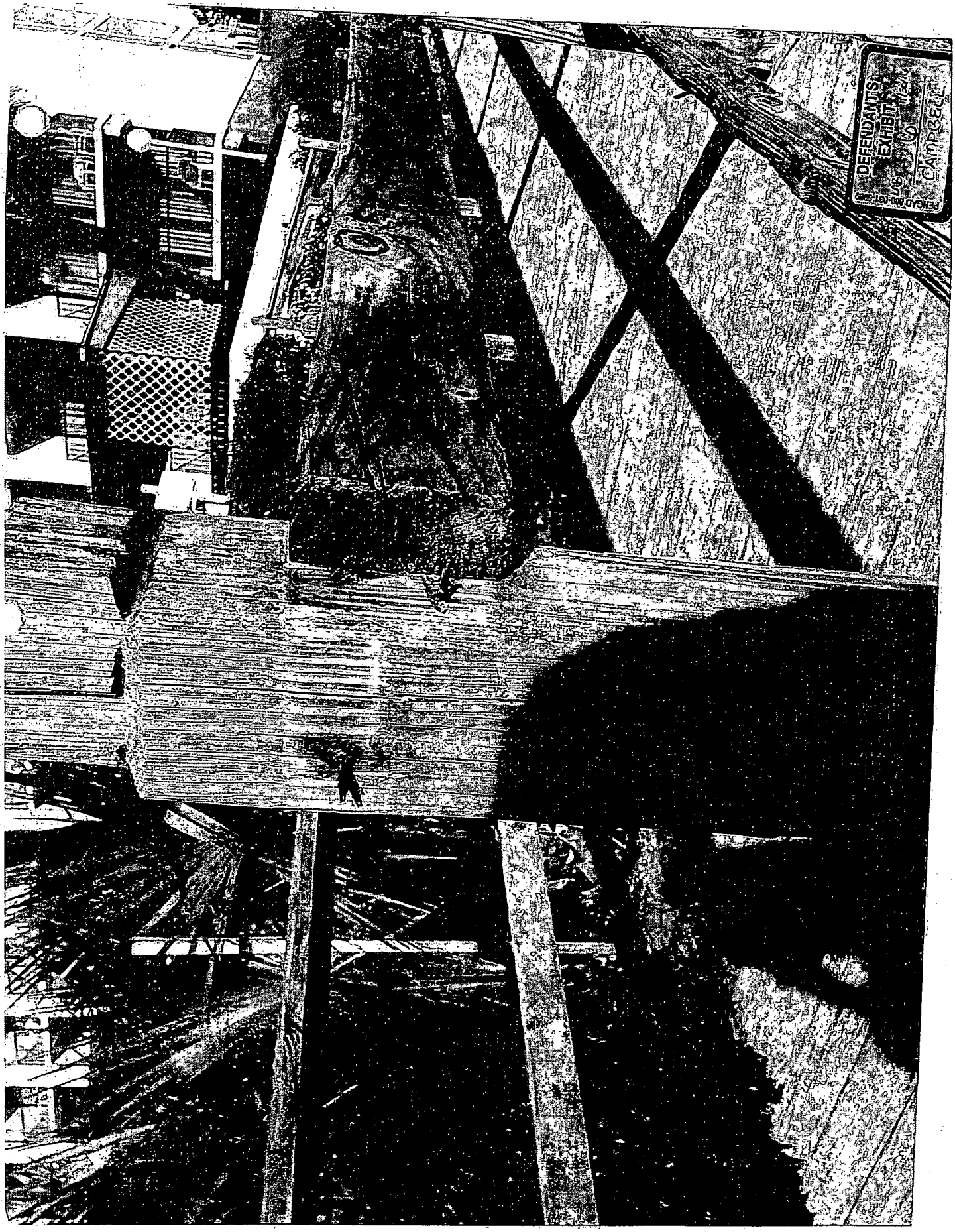
Alan O. Campbell

SWORN AND SUBSCRIBED before me,
this 1 day of September, 2016.

Notary Public for South Carolina
My Commission Expires: 12-14-2020

LISA A KOEHLE
NOTARY PUBLIC
COMMISSION EXPIRES
DEC. 14, 2020
SOUTH CAROLINA


DEFENDANT'S
EXHIBIT
CAMPBELL


DEFENDANT'S
EXHIBIT
CAMPBELL

STATE OF SOUTH CAROLINA
COUNTY OF HORRY

COURT OF COMMON PLEAS

Richard Ciampanella,
Plaintiff,
vs.
City of Myrtle Beach,
Defendant.

CIVIL ACTION NO.
2014-CP-26-7790

DEPOSITION OF: RICHARD KIRBY
DATE: Tuesday, May 24, 2016
TIME: 9:38 a.m. - 10:47 a.m.
LOCATION: Collins & Lacy, PC
11943 Grandhaven Drive, #D
Murrells Inlet, South Carolina
TAKEN BY: Attorney for Plaintiff
COURT REPORTER: Michele E. Starkey
Certified Shorthand Reporter

STARKEY COURT REPORTING
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STIPULATIONS

It is stipulated between Counsel that this deposition is being taken pursuant to the South Carolina Rules of Civil Procedure.

It is also stipulated between counsel for the respective parties and the deponent that the deponent will not waive the right to read and sign this transcript.

RICHARD KIRBY
being by me first duly sworn, was deposed and said as follows:

EXAMINATION

BY MR. CONNELL:

Q. Mr. Kirby, would you tell us your name, please, sir?

A. Richard Kirby.

Q. And I see you must have driven a truck outside that says risk management on it?

A. Actually, no, that's the guy I rode with, Tom Anderson's truck. I'm the parks superintendent for the city.

Q. And how long have you been the parks superintendent?

A. Well, this time around, eight years. I was the -- I worked for the city for 36 years. I was the

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first parks superintendent back in the '80s when we developed the parks department, so I was there from '86 to like '93. And then when the Air Force base closed, I moved out to the golf course, Whispering Pines, and ran the golf course for like 12 years, and now I'm back in the parks department. I've come back home so...

Q. So the parks department encompasses what?

A. Trees, grass and shrubs, all the landscape maintenance, beach maintenance. We have Ocean Woods Cemetery. We have litter crews that go around town and pick up litter from the streets and stuff, okay.

Q. Okay.

A. That's what it has currently.

Q. And in regard to the beach -- we're here about a beach walk, is that right?

A. Um-hum, yeah.

Q. What kind of training do you have in maintenance of beach walks?

A. Well, we had the -- until a year ago, the building maintenance division was in the parks department sort of by default, okay? Couple of retirements, and the building maintenance was transferred into my division. And that's when I took over the -- supervising the people who maintain the

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Q. All right. And let me ask you what Tom's last name would be.

A. Anderson.

Q. Is he still with the city?

A. Yes.

Q. Okay. And who developed the protocol of every three years for a beach walkover inspection?

A. Tom.

Q. Is he still doing that?

A. Yes. The next one is scheduled for next year.

Q. All right. And in 2011, how do you know that he inspected each beach walkover in Myrtle Beach?

A. He has a written report.

Q. And this is what's been provided to me, a walkover inspection report?

A. Um-hum.

Q. Is that what you're referring to that Tom Anderson would have done?

A. No. This is not Tom's. In addition to what Tom Anderson did, okay, the building maintenance division does a yearly inspection of all the walkovers.

Q. Okay. When did you start that?

A. I'm sorry?

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walkovers.

Q. Okay. And in 2014, were you the supervisor in regard to the beach walks?

A. Yes.

Q. Okay. And how long had you been doing that prior to 2014?

A. 2012.

Q. So you started supervising the beach walk -- walkovers in 2012?

A. I started supervising the people who maintained the beach walkovers, not necessarily the walkovers themselves.

Q. All right. And prior to 2012, who had done that work?

A. That was a gentleman who worked for us. His name is Matt Goyak, and he retired. And then Edsel Mishoe sort of took that over, and Edsel was in charge of the staff who looked after the beach walkovers in 2014.

Q. Okay. What kind of inspection protocol was in force and effect in 2012 on the beach walkovers?

A. Our risk management person, Tom, did -- does a risk management inspection of all the walkovers every three years. He did one in 2011. He did another in 2014.

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Q. When did they start that, sir?

A. They started long before I was involved in it. I don't know exactly, okay, but I do know that it was -- that it was done in 2011. Tom did his in 2011. Our people, building maintenance, did it in 2011, 2012, 2013, 2014. This report, okay, is -- okay. You got two reports that are combined.

Q. All right, sir.

A. This one, the one that has no corrective actions, this is Tom Anderson's.

Q. Okay. Let's mark that as No. 1, please, sir.

A. Okay.

Q. Let's mark this one. Do you mind if I keep this or do you want me to put it in the record?

MR. BRYAN: I can make copies. We'll put it in the record. Want me to make copies now?

MR. CONNELL: Sure.

(A short break was taken.)

BY MR. CONNELL:

Q. Let's let you separate which ones are different, what you were talking about.

A. What I mentioned was an example of the reports that building maintenance division did is this one that has that list and it has Paul and what was done out here.

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Q. All right. Let's take this one first and mark this as No. 1.
(Plaintiff's Exhibit No. 1 was marked.)
A. And then this is an example of the inspections that Tom Anderson did. See the difference in it? He's got "no corrective actions needed."
Q. Yes, sir.
A. Okay. And so what happened was when Paul -- I'm sorry. When Tom would do this, we would, for example, take this. Okay? A work order similar to this --
Q. Okay.
A. -- was created and then we did the work and it went on our list.
Q. Okay.
A. Okay? Does that make sense?
Q. Yes, sir. Let's make that No. 2.
(Plaintiff's Exhibit No. 2 was marked.)
Q. Okay. And then No. 3 is the repair?
A. It was a -- that was a typical work order. Okay?
Q. All right, sir. Let's make that 3 and No. 4.
(Plaintiff's Exhibit No. 3 and 4 was marked.)
Q. Just so I understand. Exhibit No. 2, 2014

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corrective actions for beach access points, that was done by Mr. Anderson in 2014?
A. Yes. Yes, sir.
Q. All right. Do we know what date that he did his report, Exhibit 2?
A. Yes. June the 9th.
Q. Okay. Okay. Where do you understand that this particular accident happened? What beach access point?
A. 77th Avenue North.
Q. All right. Can you look at Exhibit No. 2 and tell me if beach access point at 77th Avenue North was inspected.
A. Yes, sir.
Q. All right. And what was found at that point?
A. No corrective actions.
Q. Okay. And what date was the 77th Avenue Beach access --
A. There's not a specific date on this sheet, but June the 9th is the date on the cover sheet.
Q. All right, sir. So is it your testimony then that all the beach access in Myrtle Beach were inspected on June the 9th?
A. Yes.
Q. How many are there? Do you know?

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A. There are 120 something. I don't know the exact number. It changes a little bit. He -- I don't know how many days it takes him to do that.
Q. Okay.
A. You'll have to ask him that question.
Q. All right. And so we don't know exactly what day he --
A. I know it was within a day or two of June the 9th because I believe his procedure is he does them all -- he starts at one end and goes to the other.
Q. All right. Now, Exhibit No. 1, the walkover inspection report, that was work that was done by building maintenance? Is that what I understand?
A. Yes, sir.
Q. All right. And on 77th Avenue North, would you look on Exhibit No. 1 and tell me if any work was done.
A. Yes.
Q. All right. And when was that work done?
A. I believe our inspection report has a color coding that is not showing up on this. This was updated in 2013, but according to this, that repair on 77th Avenue was August 6, 2012. That's in that column right there.
Q. And that's the one that's got the shaded --

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A. Yeah.
Q. --portion?
A. That's 77th Avenue, replace pickets and put some new screws in, stringers, that kind of stuff.
Q. Do you have a beach access inspection report for 2013?
A. I'm not sure.
Q. Okay. My understanding is it was done every year; is that right?
A. Yes, sir.
Q. All right. So the repairs were done in 2012 to 77th Avenue North, and that's Exhibit 1, and Exhibit 2 is the 2014 corrective actions beach access report.
A. Right.
Q. Have you gone and looked to see if there's a 2013?
A. We did look. Basically is the way we did it was, see here? It says this report -- this 2012 report was updated in 2013. So it's a combination report.
Q. Okay.
A. See, you have some here that show -- has some 2014 dates. So this is a combination report of multiple years.

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Q. Okay. And looks like Exhibit No. 1 does not have -- from what I can tell, doesn't have any 2013 inspections.
A. On the two pages that you have --
Q. Yes.
A. -- does not.
Q. All right. And also looks like on page two of Exhibit No. 1, 77th Avenue North, there was also some repairs done at the 77th Avenue North in 2000 --
A. February of 2014.
Q. All right. And what kind of repairs were done at that time?
A. Pickets, which are vertical rails or vertical accent pieces, not structural.
Q. Okay.
A. A new step and refastened some loose boards.
Q. Okay. Now, have you had a chance to look at -- let's mark these Plaintiff's 5 and 6.
(Plaintiff's Exhibit No. 5 and 6 was marked.)
Q. Have you had a chance to look at photographs --
A. I did, um-hum.
Q. All right, sir. And can you tell me whether or not any of the areas where it looks like the boards

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A. No.
Q. All right. Which would be the bottom rail?
A. This one, the one that's still standing.
Q. All right.
A. Still attached.
Q. All right. And does your -- either Exhibit 1 or 2 show that the bottom rail was repaired?
A. I'm sorry, you'll have to repeat that.
Q. It says "replace missing bottom rail."
A. Oh.
Q. So does either of your inspection reports line up with that?
A. No, because the dates are different.
Q. Okay.
A. That date would not be on this particular page.
Q. Okay. I'm unclear why it would not be on that particular page. It didn't go back that far? Is that what you're saying?
A. No. I don't know. This was March. This was August.
Q. Okay. Do you have --
A. I don't know the answer to that.
Q. Do you have any walkover inspection reports that go back before August 14, 2012?

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have fallen were repaired by the city building department in 2012 or '13?
A. No. Those would not have been -- that's not on this report.
Q. Okay. And is there any indication on either Mr. Anderson's report that's Exhibit No. 2 or on the building maintenance that there was any defect determined in the area where the plaintiff fell in this particular case?
A. No.
Q. Okay. Do you know how long the walkway is at 77th Avenue North?
A. You mean in distance?
Q. Yes, sir.
A. I do not know exactly. From memory, I'm going to say maybe 80 feet.
Q. Okay.
A. 70, 80 feet, just from working from memory.
Q. All right. Let me let you look at Exhibit No. 3 from 2012 at 77th Avenue North.
A. Okay.
Q. And what does it indicate had been repaired?
A. A bottom rail.
Q. All right. Would this be a bottom rail, the one that's kind of catty-corner there?

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A. I honestly don't know.
Q. Okay. When did you start making the walkover inspection reports?
A. I believe -- well, it started -- that I was involved in was after 2012.
Q. So prior to 2012 you're not aware of any walkover inspection?
A. No. I know they were done; I just was not involved with them.
Q. All right. Fair enough. Let me let you look at Exhibit No. 4, and that's a walkover -- that's a repair of what, August 20th?
A. August 20, 2014, um-hum.
Q. Do you have a corrective action report from Mr. Anderson or a walkover inspection report which either connects with Exhibit No. 4?
A. Should be. If a work order was done on it, it should be in the report.
Q. Okay.
A. But I don't see it.
Q. This it?
A. And this was February 2014. But obviously this was done.
Q. All right.
A. This was done.

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Q. But it's not on the walkover inspection report, is that right, Exhibit No. 1?
A. No.
Q. And it's not --
A. Not on the one that you have.
Q. Okay. And it's not on the corrective action Exhibit No. 2, is that right?
A. There were no corrective actions necessary.
Q. All right. So can you explain why it's not on the walkover inspection report?
A. No.
Q. Has there been work done out at the beach accesses that are not on the walkover inspection reports?
A. Probably.
Q. All right. And so are the walkover inspection reports a true and accurate reflection of the work that's been done based on what you've seen?
A. What's in the report is accurate, yes.
Q. But it's not all encompassing, is it? Because it didn't have this particular repair on it, Exhibit 4.
A. We have multiple people that look after our beach accesses.
Q. Besides Mr. Anderson, Mr. Goyak, and

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yourself, who --
A. We have multiple people that work in the parks division that are at those beach accesses every day on a regular basis. Sometimes if they see a minor board that would be loose, they would just fix it themselves and it may go unreported.
Q. Okay. Apparently in August 20, a gentleman by the name of Edsel --
A. Um-hum.
Q. He works at the city?
A. He was the building maintenance supervisor for -- or he was building maintenance supervisor.
Q. Is he no longer employed there?
A. He is retired.
Q. What's his last name?
A. Mishoe. M-I-S-H-O-E.
Q. Okay. And requested by Richard Kirby?
A. That's me.
Q. All right. So what caused you to request that work be done on August 20, 2014?
A. We got a report that the railings were broken at 77th Avenue North.
Q. Who reported that to you?
A. I don't know exactly.
Q. Did you take a written report?

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A. This was a phone call. I really don't know who did it. And this is our written report. There was an emergency call and the problem was the top rail has fallen off of the access. We -- because it's an emergency, we immediately sent Edsel up there to take a look at it and fix the problem.
Q. Okay. And let me show you this loss report that Mr. Ciampanella made to the City of Myrtle Beach. Would that have prompted you to get the work order we're talking about in Exhibit No. 4?
A. This was filled out after the repair was done. So we made the repair before this was done if you look at the dates on it.
Q. Yes, sir. So this -- it was scheduled August 20th, and this Mr. Ciampanella fell on August 19th.
A. But the date on the report is the 23rd. That loss report does not go through my division anyway.
Q. Okay.
A. I would not have seen that.
Q. All right. So do you know how you found out that there had --
A. One of our staff called and said there's a problem.
Q. Okay.
A. I don't know exactly who that was.

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Q. All right. Did you take any other notes in that regard?
A. No.
Q. All right. In looking at Exhibit No. 4, were you -- did you go out and look at the beach access at 77th Avenue?
A. I did.
Q. And did you go out and see Exhibits 5 and 6, the --
A. I did.
Q. And why did you go out there?
A. In response to an emergency call, I go to -- out to check things out.
Q. Okay. And what did you find when you went out there?
A. What was in the pictures, that this board was on the ground and that board was that way.
Q. All right. And the board that was on the ground would have been the top rail?
A. It would have been the top rail. As you can see, the side rail is still attached, so the board on the ground is the top rail.
Q. Had you been advised that someone had fallen?
A. I knew that someone had fallen. I can't promise you I knew exactly when. It was before or

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after I went to look at it.
Q. All right. Had you had this same type of situation before where the top rail and some of it -- one of the side rails had fallen?
A. Not to my knowledge.
Q. Have you had a situation where screws had rusted through to cause the rails to break when you leaned on them?
A. We believe that that's -- that these -- this failed because the screws rusted.
Q. Okay. Had you had that condition before on any other beach access?
A. Not to my knowledge, no, sir.
Q. Had you ever had another injury at a beach access where someone had fallen off the beach access to your knowledge?
A. Not to my knowledge, no.
Q. Was the same boards put back up or did you put new boards up or do you know?
A. I do not know. Edsel made that repair. I do not know.
Q. Did you make any additional records?
A. Did I make any additional -- I'm sorry. I don't know what you mean.
Q. Did you write any additional records about

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what had happened other than what we've seen here? You said it was an emergency. I just wondered if you had written any reports thereafter.
A. I don't -- I don't think so. This work order is our standard procedure, so I don't think I did anything differently.
Q. Are the beach walkways inspected for rusting screws?
A. They're inspected for loose screws. It's kind of hard to see inside the wood if they would be rusted, so I don't really know how to answer that question.
Q. Are screws being used galvanized screws or are they not galvanized?
A. These were galvanized screws, of this particular one.
Q. How do you know that?
A. Because I know that's what the standard was when we built -- or when walkovers were built, it was a galvanized screw.
Q. What is the normal life of a beach walkover access?
A. I don't think there's a standard answer to that question.
Q. When was the beach walkover access at 77th

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Avenue built?
A. I do not know.
Q. Was it -- when did you start at the city of Myrtle Beach?
A. I started in 1979.
Q. Was there a beach walkover at 77th Avenue North?
A. I do not know. That was not in my division at that time.
Q. When did the beach walkover access become part of your division?
A. When I became parks superintendent the first time, in 1986.
Q. Okay.
A. I was --
Q. Were there beach walkover accesses in 1986 at 77th Avenue?
A. I don't know. To answer your question, in 1986 I was only responsible for the landscape maintenance of the beach accesses because that's what I was, the park superintendent.
Q. Okay.
A. So I don't -- I wasn't involved in walkovers at that time.
Q. All right. Do you have any knowledge as to

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when the beach accesses were built at 77th Avenue North?
A. I have a guess.
Q. Okay. Tell me.
A. After Hurricane Hugo.
Q. 1989, 1990?
A. 1990.
Q. All right. Do you know who actually constructed the beach --
A. I do not.
Q. Do you know whether or not there was an inspection protocol from 1989 until 2012 when you started doing that?
A. I'm sure there was but I don't know what that protocol was.
Q. All right. The forms that we've seen, Exhibits 1 and 2, were those forms designed by you or were they already used?
A. No. They were -- I don't know who designed them, and to my knowledge, they were already being used.
Q. All right. Exhibit No. 1, the walkover inspection report, it looks like 77th Avenue had actually had two repairs. Is that right, sir?
A. Yes.

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Q. All right. Can you point to any other walkovers that had had two repairs based on the walkover inspection report that you've given to me?
A. 73rd. There may be others.
Q. Show me the two on 73rd if you would, please, sir.
A. 73rd Avenue North, August 8, 2012. 73rd Avenue North, February 7, 2014.
Q. All right. Is it your understanding that the beach walkover accesses in the 70s blocks had been built prior to the other walkover accesses on the south end being built?
A. I don't know the relationship between the two.
Q. Okay. Who would know the age of the beach walkover access at 77th Avenue North?
A. I don't know.
Q. Have you ever -- in your tenure, have you replaced a complete beach walkover access since you've been there?
A. Oh, yeah.
Q. From top to bottom ever?
A. Yes, top to bottom.
Q. Okay. Where?
A. Multiple locations.

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Q. How about 77th Avenue North?
A. No.
Q. What's the -- when did you start doing that? When you decided to replace the entire walkover?
A. We have a capital replacement fund for beach walkovers.
Q. Okay. And does that determine when they're going to be replaced based on what's in the fund?
A. No.
Q. Is the city responsible for maintaining the beach walkover accesses in the city of Myrtle Beach?
A. Yes.
Q. And how long has the city been responsible for doing that?
A. As long as I have worked here.
Q. City crews build the walk -- beach walkover accesses or was that done by a contractor or do you know?
A. Both.
Q. Okay. And the ones that were replaced, were they replaced by city employees or were they replaced by a contractor?
A. Both.
Q. Okay. And do you know whether or not the 77th Avenue beach walkover access was built by the

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city or built by a contractor?
A. I do not know.
Q. Would you have -- is there any record that you could tell us on whether that was the case?
A. Not to my knowledge, there's a record of that.
Q. Is there a pecking order currently in place as to when a beach walkover access will be replaced? Do you have a list of the --
A. We do.
Q. Okay. Can you tell me when the 77th Avenue beach walkover access was to be replaced?
A. I cannot.
Q. Do you have an actual document that shows the order as to when?
A. I did.
Q. Okay.
A. Okay? Building maintenance is no longer in my division.
Q. Yes, sir.
A. And approximately three years ago the responsibility for selecting the order of walkover replacement was transferred to our engineering division.
Q. All right.
A. So I currently do not know the status of that

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list.
Q. All right. But prior to that, you were responsible for the list?
A. Edsel Mishoe was responsible for advising me which ones needed to be replaced on that list.
Q. All right. And did you turn that list over to the city --
A. I did.
Q. -- engineering department? About what year did you do that?
A. 2013, I believe. 2013, yeah -- I think it was 2013.
Q. Okay. So when you had -- so Edsel would advise you on which ones needed to be replaced?
A. Um-hum.
Q. And you would make notes?
A. Yes.
Q. And did you put it on a form like what we've seen here?
A. No. It was just a list of locations.
Q. All right. And how many pages do you think that document was?
A. It was just one.
Q. All right. Was it handwritten?
A. No. It was typed.

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Q. Okay. About how many were on the list?
A. No more than 20.
Q. And when did you turn that over?
A. I believe it was 2013.
Q. And I take it you only had a specific amount of money in the fund so you --
A. Correct.
Q. How much does it cost to build a beach walkover?
A. They're all different.
Q. How much would it cost to build the one at 77th Avenue?
A. Couldn't tell you. Engineering might be able to but I can't.
Q. Okay. Has the one at 77th Avenue been replaced to your knowledge?
A. No.
Q. Have there been any other repairs in 2015 or '16 to 77th Avenue beach walkover?
A. Not to my knowledge, but like I said, they're not in my division any more so I don't --
Q. I understand.
A. I wouldn't know.
Q. The ones that you had listed that needed to be repaired, the list, have any of those been repaired

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to your knowledge?
A. Yes, um-hum.
Q. Which ones? Do you know?
A. I don't know off the top of my head but there have been.
Q. So you would meet with Edsel and y'all would go look at the -- or he would just tell you which ones needed the --
A. Pretty much, yeah.
Q. Do you know what the average life is of a beach walkover?
A. They're all different. Depends on location and how they're used.
Q. Do you know what the average life is of the beach walkover at 77th Avenue?
A. I would not know that.
Q. Would Edsel know that?
A. Probably not.
Q. Who would know that?
A. I can't tell you what the life would be because we don't know when it was built.
Q. Okay. Does anybody know when it was built at the city?
A. As I said before, not to my knowledge.
Q. Do you know when the first -- well, you said

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they were started after Hurricane Hugo, I think, is that right?
A. After Hurricane Hugo, many of the beach accesses were replaced because they were destroyed during the storm. The city built beach accesses prior to that.
Q. Okay. Do you know whether or not this particular beach access at 77th Avenue was repaired or replaced after the storm?
A. I do not know specifically.
Q. Okay. All right. Do you have any other documents other than Exhibits 1 through 6 that we've looked at?
A. I don't think so.
Q. All right. Do you think you could get your hand on the list of replacements that you had given to the engineer in 2013? Would you be able to get that for us?
A. I should be able to do that.
Q. Okay. How long would it take you to do that?
A. Provided it's still in my computer, which it should be, I could probably do it today, tomorrow.
MR. CONNELL: Okay. Do you have it, Bill?
MR. BRYAN: No. First I heard of it.
(A short break was taken.)

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BY MR. CONNELL:
Q. Just a few little things. The emergency call that you got, was it recorded?
A. No.
Q. Do you know whether the city got bids from contractors to do the walkovers?
A. Which ones?
Q. Any of them.
A. New replacements in the last, I don't know, five or six years were bid.
Q. Okay.
A. The ones many years ago, I do not know the answer to that question.
Q. All right. So the new -- and 77th Avenue has not been replaced; is that right?
A. Not to my knowledge.
Q. And you don't know who -- whether or not there was contractors or bidding after Hurricane Hugo for the walkovers; is that right?
A. I don't know exactly, okay. Probably some contractors.
Q. Okay.
A. But I don't know.
Q. What's the purpose of the walkovers?
A. The purpose of the walkovers?

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Q. Yes, sir.
A. Public access to the beach.
Q. Okay. Which is provided by the city?
A. Yes.
Q. And walkover -- the monies used to build the walkovers, is that public accommodation tax?
A. I do not know where it comes from specifically.
Q. Do you know who designs the walkovers?
A. No, I do not.
Q. Thank you. Didn't have an architect?
A. I do not know.
MR. CONNELL: Okay. Thank you, sir. Subject to whatever happens with the document.
MR. BRYAN: That's fine, Gene. No problem.

EXAMINATION

BY MR. BRYAN:
Q. Mr. Kirby, for the record, I'm Will Bryan. I represent the City of Myrtle Beach. Just a couple of questions in follow-up.
Do you know the date of Mr. Ciampanella's accident?
A. I believe it was August 2014. I'm not sure of the exact specific date but it should be -- should be able to figure it out.

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MR. CONNELL: You can look at it if you want.
A. 8/19. August 19, 2014.
Q. Plaintiff's Exhibit No. 4 is a work order. Looks like a work repair done when?
A. August 20, 2014.
Q. Would like spot repairs or emergency repair calls, would those be reflected in the walkover -- the annual walkover inspection reports?
A. I'm sorry. Ask that again.
Q. Repairs that are done on an as-needed basis, like for instance in response to a call or a fall like in this case by Mr. Ciampanella, would that repair work be reflected in the annual walkover inspection report?
A. Not always.
Q. Okay. The work that is done by building and maintenance on the walkovers in response to the walkover inspection, for instance, the work performed by Mr. Paul reflected in Exhibit 1, is that work -- is a work order generated for work done by Paul in response to the -- whatever is found during the walkover inspection?
A. A separate work order is not necessarily generated.
Q. Okay. My question is the work that's

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reflected on the far right column of Exhibit 1, for instance, is there a work order for each -- for every item of repair there?
A. No, not necessarily. We are addressing the item that was brought up during the inspection and it's put into this report.
Q. Okay. Mr. Kirby, earlier you talked about the annual walkover inspections performed by the building maintenance crew, correct?
A. Um-hum.
Q. Yes?
A. Yes.
Q. Plaintiff's counsel marked as an exhibit Exhibit No. 1, and Exhibit No. 1, how many years of inspections does Exhibit 1 reflect, which is a two-page document?
A. It reflects 2012 and 2014.
Q. Okay. This page of exhibit -- the page marked with the exhibit sticker --
A. I'm sorry.
Q. Wait a second. -- at the top left shows a date of July 12, and under it it says what?
A. Updated 2013, and that's the color coding part.
Q. Okay. What has been marked as Exhibit 1 is a

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black and white copy?
A. Right.
Q. My question still is, how many years does Exhibit 1 -- how many inspections does Exhibit 1 reflect?
A. Three: 2012, 2013, 2014.
Q. Okay. If there was additional and then have a color copy -- color copy of Exhibit -- the 2012 inspection updated in 2013, and appears to be additional items of repair shown in blue, which is the same color as the updated August 2013, right?
A. Correct.
Q. Okay. If there's no blue repair work shown for a different walkover, does it mean the walkover was not inspected in the year 2013?
A. No. It means that there were no repairs made.
Q. Okay.
A. Doesn't mean it wasn't inspected.
Q. Okay. Were all walkovers inspected in the year 2013?
A. Yes, sir, best of my knowledge they were.
Q. If a walkover during the course of the inspection was found to require some type of repair, would that repair have been made?

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A. Yes.
Q. And would it be reflected in blue?
A. Yes.
Q. In Exhibit No. 1?
A. Yes.
Q. Okay. Madam Court Reporter, let's mark, I guess, this two-page document as Defendant's Exhibit 1.
(Defendant's Exhibit No. 1 was marked.)
Q. Mr. Kirby, were there repairs made to the 77th Avenue North walkover in the year 2014?
A. Yes.
Q. And what's the date of the repair work?
A. February 4, 2014.
Q. Okay. Was the 77th Avenue North walkover inspected again or later in the year 2014?
A. Yes, I believe it was inspected by Tom Anderson in June 2014.
Q. Are you referring to what's been marked as Plaintiff's Exhibit 2?
A. Yes.
Q. At that time was the building maintenance department advised that there were any additional repair work needed at the 77th Avenue North walkover?
A. No. 77th Avenue was determined no corrective

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actions were needed.
Q. Okay. Are you aware of anyone falling through the railing at 77th Avenue North, would you have been superintendent, I guess, the second time of the parks division?
A. At 77th?
Q. At 77th Avenue North.
A. Just this particular incident.
Q. You talking about Mr. Ciampanella?
A. Yes, Mr. Ciampanella.
Q. Prior to that, are you aware of any other instances at 77th Avenue North?
A. No.
Q. Since Mr. Ciampanella's incident, are you aware of any other incidents where anyone has fallen through the railing at 77th Avenue North?
A. No.
Q. Are you aware of anyone falling through a railing at any of the beach -- of the city beach walkovers?
A. Not to my knowledge, no.
MR. BRYAN: That's all I have.
RE-EXAMINATION
BY MR. CONNELL:
Q. Just a few follow-ups. Are you aware of

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whether there were any inspections of rusted screws on any of the beach walkover accesses?
A. No.
Q. No, there was never an inspection for rusted screws?
A. We inspect for loose screws and loose boards on a regular basis. You can only see the head of the screw so I'm not sure how you would inspect for a rusted screw other than just looking at the head of it.
Q. Do you know how long it takes for a screw to rust?
A. No. I guess it depends on its environment.
Q. All right. Looking at Exhibit 1, it appears that on February 4, 2014, that 77th Avenue was refastened as needed, I think is how it's -- is that right?
A. Yes.
Q. And it also appears that in August of 2012, that there apparently was some handrails that were repaired, is that right?
A. Yes. There are, however, two separate structures at 77th Avenue. Some of this repair is referring to the separate structure that's not the walkway, because the reason I know that is the walkway

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doesn't have any pickets on it, okay?
Q. Okay. So I'm hearing you say there's two separate walkways on 77th Avenue?
A. No, no, no. There's a sitting area. There's only one walkway.
Q. Okay. And the area that was repaired was not the walkway?
A. No. Both areas were repaired.
Q. All right. I guess I'm unclear of what you're trying to tell me there. Refastened about six handrails, where were those handrails? Do you know -- if you know.
A. Both structures have handrails.
Q. Okay. Which ones did they repair in August 2012? Says fastened handrails.
A. Refastened six. It doesn't specify.
Q. And you don't know, I take it, is that right, which ones were refastened?
A. I don't know exactly which ones were refastened.
MR. CONNELL: All right. We just want to leave it open, just for the -- if you would give him -- may not do anything else. I just want to look at it, see if that's --
MR. BRYAN: That's fine.

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MR. CONNELL: Okay. You want him to read and sign?

MR. BRYAN: Yeah.

MR. CONNELL: He'll talk to you about -- you got a right to read and sign the deposition. This lady will put it in a little booklet form and you can look at it.

(Deposition was adjourned at 10:47 a.m.)

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STATE OF SOUTH CAROLINA
COUNTY OF HORRY

CERTIFICATE

I, Michele E. Starkey, a Notary Public for South Carolina, do hereby certify that the within named witness, RICHARD KIRBY, was by me first duly sworn to testify the truth, the whole truth, and nothing but the truth in the cause aforesaid.

That the testimony then given was reduced by me to stenotype in the presence of said witness, subsequently transcribed onto a computer under my direction, and that the foregoing is a true and correct transcript of the testimony so given as aforesaid.

I do further certify that this deposition was taken at the time and place as specified in the foregoing caption, and that I am not a relative, counsel or attorney of either party, or otherwise interested in the outcome of this action.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal of office at Myrtle Beach, South Carolina, this 1st day of September, 2016.

MICHELE E. STARKEY, Notary Public for South Carolina
My Commission expires September 29, 2021.

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VERIFICATION OF DEPONENT

I, RICHARD KIRBY, have read the foregoing deposition consisting of 44 pages, which was reported by Michele E. Starkey, Court Reporter and Notary Public in and for the State of South Carolina, on May 24, 2016.

I find the transcript of this deposition to be a true and accurate transcript according to my testimony on that date with the exception of corrections as listed on the attached correction sheet, which was filled in by me.

_____

_____, 2016

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ERRATA PAGE

PAGE #	LINE #	CHANGE AND/OR CORRECTION (AND EXPLANATION)

THE ABOVE CHANGES WERE NOTED BY ME ON THIS ERRATA PAGE BEFORE SIGNING THE ATTACHED VERIFICATION OF DEPONENT. I HAVE RETAINED A COPY OF THIS ERRATA PAGE FOR MY RECORDS.

DATED: _____

_____
RICHARD KIRBY

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State of South Carolina	)	Court of Common Pleas
	)	15th Judicial Circuit
County of Horry	)	Case No. 2014-CP-26-07790
	)	
	)	
Richard Ciampanella,	)	
	)	
Plaintiff,	)	
	)	
-vs-	)	Transcript of Record
	)	
	)	
City of Myrtle Beach,	)	
	)	
Defendant.	)	
	)	

March 6, 2018
Florence, South Carolina

B E F O R E:

The Honorable Thomas A. Russo, Judge

A P P E A R A N C E S:

Gene M. Connell, Jr., Esquire
Attorney for the Plaintiff

William A. Bryan, Jr., Esquire
Attorney for the Defendant

Krystal J. Smith
Circuit Court Reporter

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NO.	DESCRIPTION	ID.	EV.
	(No Exhibits Presented)		

COURT REPORTER LEGEND

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[sic]		written as said

MARCH 6, 2018

(WHEREUPON, the proceedings began at 9:32 a.m.)

THE COURT: All right. Well, this is Plaintiff's motion for a new trial, which was timely filed, and there were -- some of the time that has elapsed is because we were awaiting transcripts and stuff.

MR. CONNELL: Yes, sir.

THE COURT: And, Mr. Connell, I think you have everything?

MR. CONNELL: Yes, I do. Yes, sir.

THE COURT: All right. Well, if we're ready to proceed, we'll hear from you, sir.

MR. CONNELL: Your Honor, it's cruel and unusual punishment to have to look at Judge Anderson up there after having spent two years with him and being in the Army before. It was worse being with him. It was two years in this building here. I feel like I'm going back to my youth or something.

MR. BRYAN: He's got PTSD, Judge.

THE COURT: He's having PTSD.

MR. CONNELL: I assume his picture is going to go across the street to the new courthouse somewhere, but --

THE COURT: You know what? I cannot -- I don't know. I assume they probably will, but I don't know what their intentions are.

MR. CONNELL: I'm sorry. I can turn around.

Your Honor, you've got -- I think you have our brief.

THE COURT: I do. Yes, sir.

MR. CONNELL: It's probably 8 or 10 pages.

THE COURT: Yes, sir.

MR. CONNELL: And I know -- I'm sure you don't have the transcript.

THE COURT: No.

MR. CONNELL: And as I told you before, I hate having to argue a motion for reconsideration because it's almost like we're trying to tell you that you made an error, and I'm really not trying to do that. I'm just --

THE COURT: Well, I'm not above making errors. So it's okay. I don't take it personally.

MR. CONNELL: But I -- some people take that personally. As I told you before, I really don't --

THE COURT: I don't.

MR. CONNELL: It's an unusual rule because in the federal court you don't have to do this. You just file an appeal.

THE COURT: Sure.

MR. CONNELL: And so, Your Honor, I've really -- I've brought the transcript. I want to give it to you.

THE COURT: Okay.

MR. CONNELL: If you want to look at it. I know you're

moving and all, but I really think there are some significant issues that would prove that Your Honor should give us a new trial.

THE COURT: Okay.

MR. CONNELL: And I'd like to go through them, if I could.

MR. BRYAN: Gene, do you have another copy of your brief?

MR. CONNELL: I just have the one.

THE COURT: I can get you a copy.

MR. BRYAN: I've never seen it.

THE COURT: Emily -- Emily will --

MR. BRYAN: Okay.

THE COURT: -- run get us one real quick.

MR. BRYAN: Okay. Thank you.

THE COURT: We'll just -- we'll just take it easy while we get that.

(WHEREUPON, there was a pause in the proceedings, after which the proceedings resumed as follows.)

THE COURT: All right. Mr. Connell?

MR. CONNELL: So, Your Honor, as you remember, you tried this case for three days I want to say down in Horry County --

THE COURT: Yes, sir.

MR. CONNELL: -- last year, and your ruling was

specifically about the issue of notice. You indicated in your ruling at the end of the trial that we had not proven notice that this specific walkover -- as you remember, Your Honor, there are over a hundred walkovers.

THE COURT: Yes.

MR. CONNELL: And your -- your statement at the end of the case was we had not proven sufficiently that that particular walkover had a defect in it.

And as Your Honor knows, the motion -- in a motion for a decision on whether to grant an involuntary nonsuit with prejudice or a directed verdict motion, all inferences are in favor of the plaintiff, as Your Honor knows. And so it's somewhat difficult to get that.

But Your Honor's position was that, hey, you can't prove this particular walkover has a particular problem which you can point to that caused this defect, and our position has always been that -- and I think Your Honor would agree -- this man was doing nothing wrong. All he did was lean against the railing and he fell and was injured.

And, Your Honor, since that time, I've done a little extra research. I want to pass up this case to you. It's a 2015. It's called Major v. The City of Hartsville. It was tried by Judge Burch.

THE COURT: Okay. Thank you, sir.

MR. CONNELL: Yes, sir.

And, Your Honor, in that case, the -- Judge Burch granted summary judgment on the specific issue that you did in this case. And what Judge Burch said -- there were some ruts in the highway in the city of Hartsville and they had been repairing them over the course of time.

And on page 2 of the opinion, if Your Honor -- page 3. Judge -- Judge Burch thought, well, you know, you can't prove this specific rut was the cause of this problem and since you can't prove this specific rut is the cause of this problem, then I'm going to grant summary judgment. And that was appealed to the Court of Appeals, and the Court of Appeals agreed with Judge Burch and said, yeah, you're right.

The Supreme Court took the matter up on the issue of actual and constructive notice and, in the opinion, the Court said constructive notice is a legal inference which substitutes for actual notice. And it goes on to say constructive notice arises when a condition has existed for such a period of time that a municipality in use of reasonable care should have discovered the condition. And then it goes on to say the recurring condition may be sufficient to create a jury issue as to constructive notice.

So, Your Honor, our argument at the outset is is that the term actual notice and constructive notice as inferred by the Supreme Court in this Hartsville case are one and the same. And if you can show a recurring condition, then that's

enough to get to the jury in the case.

And, Your Honor, what -- what the transcript would show to you and what our brief would show is that we had expert testimony that -- (a) that the City knew the hazard was something that was out there. There are actually exhibits in the record. I thought about bringing you all of the exhibits, but I couldn't get to the clerk to let me take them from Conway. She wanted to keep them.

But Al Campbell, the expert, indicated in Exhibit 17 that they did not comply with their own maintenance schedule. That this walkover construction was defective. As Your Honor remembers, the question was whether or not you should use screws or bolts, and the OCRM documentation indicated that bolts should be used and screws should not be used.

And so Al Campbell went on to say that there were multiple failures on these decks, that they knew about it, that it was recurring, and that they had done the construction, and that's one of the most important parts of this case. The -- this was not a situation where they hadn't done the construction. Here, they actually performed the construction, did the repairs, and they were building things and they were building them in violation of the OCRM Rules and Regulations.

So Allen said that -- also indicated that they violated several codes. The International Property Maintenance Code,

as Your Honor probably doesn't remember, but the International Property Maintenance Code was adopted by the City of Myrtle Beach in the 1990s. The International Property Maintenance Code applies to the City in that they had to maintain their property in a certain condition.

And then Exhibit 26, which was in the record, requires that they do that, and then Exhibit 28, which is in the record, is the Coastal Construction Manual, and it addresses issues just like we have here, a recurring condition that they were aware of, just like in the case I presented to Your Honor, the Major case that you have in front of you.

Exhibit 25 and Exhibit 30 all talk about industry standards. Mr. Campbell said in great detail that the industry standards were not followed by the City of -- of -- of Myrtle Beach and that they obviously knew that their -- this was not going to last and it should have been, quote, salvaged or replaced years ago, and they had no maintenance schedule.

On cross-examination, he went on and on to say that, look, the standard in South Carolina for building construction is the OCRM requirements that you build it with bolts, and he said those standards were not used and, as a result, that's what caused this problem. He said OCRM recommends that you use the one-half-inch bolts, as opposed to the screws, and he said that they built the walkover and

the walkover was not built the way it was supposed to built -- be built.

So then he was asked on cross-examination do you have an opinion why the railing constructed by the City was consistent with OCRM Rules and Regulation? Do you have an opinion to a reasonable degree of certainty? And he said, no, it does not follow any of the rules. It does not qualify. They did not build it in a -- in a proper fashion.

And he goes on to talk about the lag bolts and the violation of the International Building Code and the International Property Management Code. He said they were not -- they violated the International Property Management Code because they were not firmly fastened and did not meet the requirements of the code.

He then talks about the FEMA Construction Manual. As Your Honor knows, FEMA requires certain things to be done in a coastal environment, and he said that they weren't -- they didn't -- they violated the FEMA Construction Manual in the way they constructed the dock and the way they finished it in the end.

And then he said the opinion -- his opinion is city inspection techniques were not correct. Employees would have seen this problem as they were inspecting the areas, and that they should have done something about it.

He then goes on to say that there's a 1994 Standard

Building Code, and they didn't even follow that. And he says that it's my opinion that improper construction and maintenance injured the plaintiff when he simply leaned on the railing and, as a result, it broke under very little pressure. That's in -- that's page 292 of the record on appeal -- or not the record on appeal, but the transcript.

He also then says you know what? The City knew that this walkover was clearly identified for replacement, kind of like what we have in this Major case I just handed to you. He said they knew that it had to be replaced. They just hadn't gotten to it.

They didn't follow industry standards. They had repetitive failures of these walkovers all up and down the beach, and they obviously knew about it and he says there was, quote, clear evidence of maintenance and good construction. That's page 311 of the transcript.

And then he goes that under the National Property Management Code, the rails must be safe and maintained in a safe manner, and the -- they must maintain them such that they will not collapse.

And Your Honor talked about the residential or the -- there were some other statutes that were brought into -- into the -- into the case, but Your Honor didn't rule on those issues. You only ruled on the issue of constructive notice and whether there was constructive notice.

And, Your Honor, we take the position respectfully that the evidence of the expert and the other evidence that was offered in the trial clearly show that based upon this Major case that I just passed up to Your Honor that even though Your Honor -- and Your Honor made a good point. You said you can't prove this particular dock or deck is -- is defective.

And we argue to Your Honor that we don't actually have to do that:

(a) When you build it -- and they built it and they're supposed to maintain it, and

(b) When they know it's a recurring problem.

And that as a result, Your Honor should respectfully have let the jury decide the issue.

And, Your Honor, we'd like to -- if Your Honor wants to, I'd like to give you the transcript. If you don't want it, I understand, but I think that if you look at Mr. Campbell's testimony -- you know, it's over a day and a half, as Your Honor remembers -- you're going to find that he has tracked the Major case completely all the way down as to where we should be.

And so, Your Honor, we would ask that the Court respectfully grant our motion for a new trial and return it to Horry County.

THE COURT: All right.

MR. CONNELL: Thank you, Your Honor.

THE COURT: Thank you, sir.

MR. BRYAN: Judge, Will Bryan for the City of Myrtle Beach.

I don't have a copy of this Major case, Judge, but I believe Major deals with a different subsection under the Tort Claims Act. If I recall correctly, Major deals with Section 15-78-60, Subsection -- I believe just looking at the section myself, I believe it's Subsection 15.

THE COURT: Yeah. It was 15-78-16, Subsection 15.

MR. BRYAN: 15. Our case is Subsection 16, but 15 is relevant because Mr. Connell is talking about constructive notice and, in 15, constructive notice is relevant. In the case under Subsection 15, plaintiff can get around the City's statutory immunity by proving that the City had either constructive notice or actual notice.

That's not the case with the case that we're dealing with under Subsection 16. Under Subsection 16, Judge, the plaintiff can only get around the City's statutory immunity by proving that the City had actual notice that this railing was going to fail.

And Mr. Connell has talked -- has talked about statutes and building codes and it wasn't built properly, but the one thing he hasn't pointed the Court to and the one thing you can, I believe, rest your case on is that there is -- there is no evidence today, there was no evidence presented last

year that the City had actual notice that the railing at 77th Avenue North was going to fail.

And that's -- our case is as simple as that, Judge. I mean there's -- there was no evidence last year that week of trial, and Mr. Connell has pointed the Court to no evidence of the City's actual notice that that railing was going to fail.

I'll point out that another case to -- for the Court to look at is the case of Strother v. Lexington County Recreation Commission. I do have an extra copy. Mr. Connell, I'm sorry I only have one extra copy.

MR. CONNELL: I've got that.

MR. BRYAN: Yeah.

THE COURT: All right.

MR. BRYAN: May I approach?

THE COURT: Yes, sir.

MR. BRYAN: And, Judge, this case --

THE COURT: Thank you.

MR. BRYAN: -- was decided under our particular subsection, that is Subsection 16. And there is a good discussion in that case, Judge, about -- and this is a Supreme Court case, and there is a good discussion about the difference between actual notice and constructive or inquiry notice.

And this case went from the Circuit Court to the Court

of Appeals and then on to the Supreme Court, but at the -- at the -- at the Court of Appeals level, there was some language in the -- in that opinion that Courts in South Carolina had sort of blurred the line between actual and constructive notice.

However, when it got to Gervais Street, the Supreme Court said we disagree. There is a clear distinction between actual and constructive notice.

Let's see.

This is the Supreme Court referring to the Court of Appeals. According to the Court, our cases have altered the meaning of these terms to the point of equating inquiry notice with actual notice, and the Supreme Court says we disagree with this interpretation of our case law.

They say that inquiry notice and actual notice has at times -- excuse me. Inquiry notice can be a substitute for actual notice, but on the very next page it goes on to say that when the Courts have substituted inquiry notice, that simply means that it can accomplish the same thing, and that is by way of -- by way of example, under Subsection 15 of that Tort Claims Act, a plaintiff can accomplish the same thing. In that case, inquiry notice would substitute as actual notice because, of course, that's one of the things that the plaintiff can show.

That's not the case under Subsection 16, Judge. The

plaintiff has to show actual notice, and the Supreme Court in Strothers said that actual notice means that -- what do they say here?

Actual notice under the Tort Claims Act means all the facts are disclosed and there is nothing left to investigate, which means if there is any inquiry that needs to be done based on a failure at the walkover at 62nd Avenue North, if there's inquiry based on that, that's not actual notice. That may be constructive notice, but that's not actual notice. Actual notice, according to the Supreme Court, is all facts have been disclosed, nothing else to investigate.

And, Judge, we submit there has -- there was no evidence at trial presented to show the City had actual notice sufficient to overcome our immunity under the Tort Claims Act.

Thank you very much, Judge.

THE COURT: All right. Thank you, Mr. Bryan.

MR. CONNELL: Judge, just a couple things in reply.

THE COURT: Yes, sir.

MR. CONNELL: In the Major case, the Court says where a recurring condition is of such a nature as to amount to a continual condition, when coupled with other factors, the recurring condition may be sufficient to create a jury issue as to constructive notice.

And then they go on to talk about constructive notice

and actual notice and what those mean and, if you look at Section 60 of 15-78-60(15), it says responsible for the maintenance within a reasonable time after actual or constructive notice.

And, Your Honor, we would argue to you that the expert clearly laid out that this is not just a condition that existed. This is something they built, and they built it in violation of the OCRM Rules and Regulations by not using the proper bolts.

And so even if the Court were to decide that there was an actual notice issue in this case, which we don't think there is, they constructed it, Your Honor. There's no actual notice that's necessary. When you build something, you are liable for what you build, and you are required to build that according to the rules and regulations.

And they violated the International Property Management Code, the Standard Building Code, and the Coastal Rules and Regulations in the construction of this deck. And on top of that, they knew about these problems because they were continually having problems with all these others.

And so we would argue to Your Honor that that fits squarely in this Major case about a recurring condition that they had notice of, even though, as Your Honor said, they didn't have specific notice of that rut. That's what the case was -- that's what this Major case was about, specific

notice of a rut that the plaintiff fell on.

But the Court went further in the -- in the Major case and said you don't have to have specific notice of the rut if it's a continually recurring condition. In this case, it's obviously that and, Your Honor, we would ask that the Court remand it or grant us a new trial on that issue.

THE COURT: You're saying that because the City built the crossover that this doesn't apply?

MR. CONNELL: I'm saying that's one of our arguments is that if you built it, you have to build it according to the Standard Building Code, the International Property Maintenance Code, and the OCRM Rules and Regulations, and Mr. Campbell, our expert, said you didn't build it properly to begin with and that's what caused the failure.

But -- but beyond that issue, this issue of actual notice, there was a recurring condition they were aware about and they were continuing to try to fix that. So, Your Honor, we would argue to the Court that under the directed verdict standard, under the standard you have to consider this case, is all evidence must be in favor of the plaintiff.

THE COURT: The -- the codes you're referring to -- what year were they enacted?

MR. CONNELL: Your Honor, our expert said all the codes were enacted prior to the construction, and that's why I had the transcript. Prior to the construction of the walkovers.

So the IPM, Standard Building Code, and the OCRM Rules and Regulations were all in effect.

THE COURT: Because if I remember correctly from reading your -- your brief, these were constructed in 1990?

MR. CONNELL: They were constructed after Hurricane Hugo, and he said all the codes apply. That question was asked. Well, how do you know? He said all the codes that were in force and effect are similar to the previous ones. That was the question.

THE COURT: So --

MR. CONNELL: And so, Your Honor, we just argue to you that if it's a directed verdict, everything has to be in -- you have to infer everything in favor of the plaintiff. In all the evidence that we presented, the 30 exhibits, Mr. Campbell's all-day cross-examination and direct examination, and the violation of these codes, which, Your Honor, clearly we think make it a jury issue.

THE COURT: All right.

MR. CONNELL: And the Major case.

Thank you, Your Honor.

THE COURT: Anything further, Mr. Bryan?

MR. BRYAN: Judge, as I recall looking at -- I don't have the Major case, and the Major case -- one major difference that I see in the Major case and our case is that in the Major case there was recurring problems that -- in

that case, it is one location. It is at one corner, as I recall. People were, like, cutting -- cutting the corner and creating a rut, and the City would repair it and then a week later it was the same, but it's the same area.

In our case, obviously, Judge, we've got 105, I believe, of these public walkovers. So the fact that there is repairs being done, you know, 60 blocks south or north of 77th Avenue North does not give the City actual notice that there's a problem with the 77th Avenue North railing.

And I would just get back to --

THE COURT: Well --

MR. BRYAN: And, Your Honor, do you have a copy of the -- of the Tort Claims -- the 15-78-60?

THE COURT: I don't have it in front of me. Do you have it in front of you?

THE LAW CLERK: Yes, sir.

THE COURT: Yeah. We've got it right here.

MR. BRYAN: Okay. Anyways -- but we would just fall back to, again, the -- the Major case is interpreted under Subsection 15. Our case is a -- is a Subsection 16 case, which requires actual notice.

A building code violation, we submit, Judge, is not going to get the plaintiff there. It is not -- it is not evidence of actual notice that the railing is going to fail.

MR. CONNELL: And, Your Honor, here's the thing about

that. When you built it wrong, you have actual notice because you built it wrong to begin with. And when they built it with the screws instead of the bolts, that is actual notice of a violation of the IPM, the Standard Building Code, and the OCRM Rules and Regulations, all of which are in the record as exhibits.

MR. BRYAN: Wait a second. May I respond to that?

THE COURT: Yes, sir.

MR. BRYAN: Actually, I did read Mr. Campbell's testimony. And on cross-examination, you probably don't recall, Judge, but the strength of the railing had a lot to do with how many screws it took, and there was a requirement under the code that the railing be able to withstand 200 pounds of concentrated force.

THE COURT: Right.

MR. BRYAN: And Mr. Campbell -- his view of the construction was that it had, let's say, two screws, and we had photographs and I -- and Mr. Campbell actually presented as exemplar to the Court, and I -- and I showed Mr. Campbell photographs and I said don't you see these nail holes right here, and he says, oh. Finally, he says oh. Your Honor kept out the exemplar because Mr. Campbell wasn't giving the City essentially credit for these additional screws that were used in the construction.

And so when I went back to Mr. Campbell and said, okay,

so the two screws that we -- that you assumed had 150 +- or would withstand 150 pounds of concentrated force, you know, let's take into consideration the other screws that you didn't consider. And he says, well, I think it might hold up to 350, maybe 400 pounds of concentrated force.

So eventually -- and I'm looking, Judge. There are several pages of this dialogue on page 328 for sure. I know it's there. But Mr. Campbell finally admitted that -- that it met that 200 pounds of concentrated force required when it was constructed.

His big thing was that there was a standard that said it just has to be kept safe and keep the public safe. And because it had failed, Mr. Campbell said, therefore, it violated that -- what do you call it? I forget what term he used, but -- but as far as the building code and it withstanding 200 pounds of concentrated force, Mr. Campbell eventually says, yes, it satisfied that construction. Those screws would satisfy that construction requirement.

I just happened to recall that, Judge.

THE COURT: Okay.

MR. CONNELL: Your Honor, in his testimony -- and this is why -- this is why the directed verdict motion we think is sufficient in this case. He said that it's my opinion improper construction and maintenance clearly injured the plaintiff. And then on cross-examination, the same question

was asked and he -- this is page 311. There was clear evidence of absence -- of absence of maintenance and good construction. That's page 311 of his opinions.

And, Your Honor, all that goes to the fact that you have to build it according to the code and then afterwards you have to maintain it under the IPM, the International Property Management Code.

So, Your Honor, we would -- we would argue that all of that and every inference has to be taken in the light most favorable to the plaintiff. That as a result, Your Honor, we should be able to have that decided by a jury.

THE COURT: I'm trying to understand. Well, first of all, one of your positions is that because they built it, there's no notice requirement. They don't fall under any notice requirement.

MR. CONNELL: They had actual notice. They built it incorrectly. I mean when you build a building incorrectly, whether you're -- I mean the whole purpose of the Tort Claims Act is to hold the government to the same responsibility that you do with a regular builder.

So if I'm a builder and I build a roof wrong, it's no defense that I didn't have -- do not have notice of it because I knew I was building it wrong because I didn't built it according to the code. And I mean that -- that is really one of the big issues in this case is, is notice really

necessary when you build it incorrectly to start with?

And that's what we argue to Your Honor in our brief as -- as point number one. You don't even have to get to the actual notice. They knew about it. They had notice.

That's -- that's like in a -- in a slip and fall case, Your Honor. If I put -- if I mop the floor at the Bi-lo and I mop it and you come in and fall, I don't have to have notice of it. I just put the wet substance on the floor. I did exactly what -- and it's different if -- if I come along and I'm a customer and I spill something on the floor and then the cust -- the employee doesn't have notice of it, but when I actually do the work and I actually use the mop, then that's notice.

And we think that is really strong in this case that -- that they had notice. Our expert clearly says they had notice of a violation of the code.

THE COURT: All right. Anything further, gentlemen?

MR. BRYAN: Judge, I just go back to Subsection 16. That subsection speaks for itself.

And lastly, there are -- the cases are legion that hold that the Tort Claims Act is to be liberally construed in favor of limiting, in this case, the City's liability.

THE COURT: What about -- what about Mr. Connell's argument that if you -- if you built it wrong on the front end, then this notice requirement is not really necessary?

You didn't comply with the building codes on the front end, so you have notice that -- that you've got an issue?

MR. BRYAN: I don't know that that means you have notice that it's going to fail. I mean that's -- the City is only going to be liable as allowed under Subsection 16, Judge, and the plaintiff would have to prove that we had actual notice that this railing was going to fail.

And in this case, there is no evidence of -- there's no evidence of any other similar failure at 77th Avenue North. There's really no evidence of any similar failures anywhere else. I mean, of course, there are repairs made to every other walkover and there were repairs made to 77th Avenue North, but there's no evidence of actual notice that that particular railing was going to fail.

THE COURT: So if there's a building code in place and your construction doesn't comply with the building code and years later there's an issue, there's still -- in your position, there's still the actual need that they have notice that they've got an issue with that walkover?

MR. BRYAN: Sure. I guess if there's a violation of statute at the time of construction, I guess that might be evidence of, like, negligence or negligence per se, but I don't know that that's -- that doesn't equate to actual notice in my mind, Judge, at least not on the Tort Claims Act.

That's the distinction I would draw. They may have one thing, but I don't know that he's got liability against the City under the Tort Claims Act under Subsection 16, Your Honor.

MR. CONNELL: And, of course, that would be double notice. I built it wrong and then I had to be notified that it was built wrong 20 years later. That -- that makes absolutely no sense under the terms of the Tort Claims Act in which the government is supposed to have the same liability as a private person. I mean we're in a situation where we have evidence in the record that it was built wrong and built in violation of all these codes, and that's enough notice when you build it wrong to begin with.

THE COURT: So -- but then what you're saying is if you build it wrong, that's strict liability?

MR. CONNELL: No, sir.

THE COURT: If you build it wrong and something happens, it doesn't matter, you're liable?

MR. CONNELL: No, sir. I'm saying that's notice that you built it wrong, if you built it in violation of the codes. I mean all the construction cases that are at the beach are all about what codes have been violated when they built it and then years later they find out, hey, you've got a defect in the roof.

It's -- it's the same principle for this case. I mean

the deck was built improperly to begin with and in violation of the codes. So the issue of you having --

THE COURT: So 16 doesn't apply?

MR. CONNELL: Yes, sir. Right. Because you built it.

Now, it would be different if they didn't build it or there was some other situation about the maintenance, but I mean our expert clearly testified --

THE COURT: What do you mean if they didn't build it?

MR. CONNELL: Well, let's say, for instance, it's a park, you know, out there and you're talking about some problem in the land. You know, there's a bunch of case law about that. Somebody falls in a hole. Well, that's a maintenance issue. They didn't -- they didn't do anything to the natural condition of the land.

But I mean this is an artificial structure that was built, maintained, operated by the City of Myrtle Beach, and their expert -- I'm sure they'll have -- they had an expert at trial. He just didn't get to testify. And if they can convince the jury what they're arguing in this case, that's fine, but it's an issue for the jury is what we're saying.

We don't argue strict liability. I couldn't get strict liability in the case. Even in the Major case Your Honor just looked at, they just said it's a -- it's an issue for the jury to decide as to whether or not that's the case, and that's all we're asking for is the right to have the jury

decide.

Thank you, Your Honor.

THE COURT: All right. Do you have the copy of the transcript?

MR. CONNELL: Yes, sir.

THE COURT: If you can leave that with us, I'd appreciate it. I would like to look at it.

MR. CONNELL: Thank you, Your Honor. Can I get this back from you sometime?

THE COURT: Yes. Absolutely.

MR. CONNELL: Because I sent the copy that came.

THE COURT: Oh, yeah.

MR. BRYAN: Judge, I have a copy you can have.

MR. CONNELL: Oh, you have the transcript?

THE COURT: Okay. All right.

MR. CONNELL: All right.

MR. BRYAN: If you can just tell me the last page?

MR. CONNELL: It goes through --

MR. BRYAN: 385 or so? 384? 385?

MR. CONNELL: It goes to 385.

THE COURT: Okay. Thank you.

MR. CONNELL: You're welcome.

THE COURT: All right, folks. Thank you. I'll go through this and have a decision for you.

MR. CONNELL: Okay. Thank you, Judge.

MR. BRYAN: Thank you, Judge.

(WHEREUPON, the proceedings ended at 10:07 a.m.)

--- END REQUESTED TRANSCRIPT ---

State of South Carolina)
) Certificate
County of Florence)

I, the undersigned, Krystal J. Smith, Notary Public and Official Court Reporter for the Twelfth Judicial Circuit of the State of South Carolina, do hereby certify that the foregoing pages, numbered 1 through 30, constitute a true, accurate, and complete Transcript of Record of all the proceedings had and evidence introduced in the hearing of the above captioned case, relative to appeal, in the Court of Common Pleas for Horry County, South Carolina, held in Florence, South Carolina, on the 6th day of March, 2018.

I do further certify that I am neither of kin, counsel, nor interest to any party hereto.

Krystal J. Smith

Court Reporter

Florence, South Carolina

October 2, 2018

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CERTIFICATE OF COUNSEL

The undersigned hereby certifies that the Record on Appeal contains all material proposed to be included by any of the parties and not any other material.[1]

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November 18, 2019.

[1] Respondent initially designated all trial exhibits in his designation of matter. However, in response to Appellant's motion to strike certain portions of his designation, Respondent agreed to strike Plaintiff's Exhibits 16, 20, 21, 22 and 23, and Defendant's Exhibits 1 and 2. (Resp't Return to Mot. to Strike, p. 7). Additionally, the Court granted Appellant's motion to strike the "Myrtle Beach Walkover Inspection Report." (Order Granting Mot. to Strike In Part, Aug. 30, 2019).